Preliminary Drainage Report

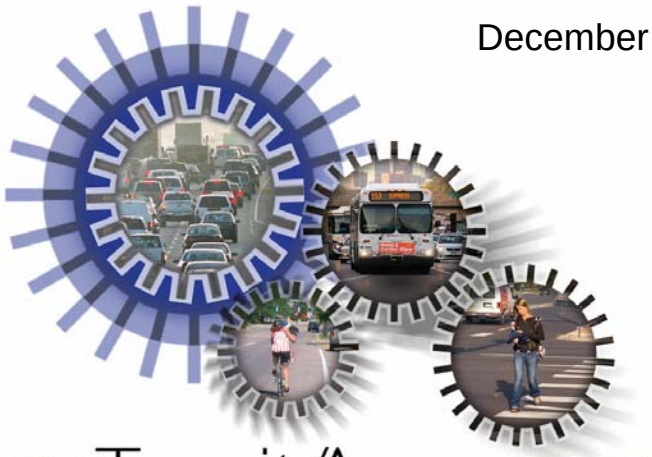
I-35W Corridor Drainage Study

I-94 to 42nd Street

Hennepin County, Minnesota

Hennepin County Project No. 9864-01
MnDOT Project No. 2782-327
SEH No. HENNC 113114, 123521

December 8, 2014



I-35W Transit/Access PROJECT

SEH

Building a Better World
for All of Us®

Engineers | Architects | Planners | Scientists

SEH

Building a Better World
for All of Us®

December 8, 2014

RE: I-35W Corridor Drainage Study
Preliminary Drainage Report
Hennepin County, Minnesota
Hennepin County Project No. 9864-01
MnDOT Project No. 2782-327
SEH No. HENNC 113114, 123521

Mr. James Grube, PE
Director and County Engineer
Hennepin County
A-2303 Government Center
300 South 6th Street
Minneapolis, MN 55487-0233

Dear Mr. Grube:

SEH is pleased to provide Hennepin County with the Preliminary Drainage Report for the I-35W Corridor from I-94 to 42nd St. S.

The report includes a CD with a PDF of the entire report, appendix items, detailed models and data used in the development of the designs.

Thank you for the opportunity to develop the preliminary drainage design for I-35W.

Sincerely,

Justin T. Klabo, PE
Senior Water Resources Engineer

s:\fj\h\hennc\113114\5-dsgn\50-waterresources\preliminary drainage report\drainage report_final.docx

I-35W Corridor Drainage Study
Preliminary Drainage Report
Hennepin County, Minnesota

Hennepin County Project No. 9864-01
MnDOT Project No. 2782-327
SEH No. HENNC 113114, 123521

December 8, 2014

I hereby certify that this report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Justin T. Klabo, PE
Senior Water Resources Engineer

Date: 12/8/14 Lic. No.: 48701

Reviewed By: Ron Leaf Date: 12/8/14

Reviewed By: Rocky Keehn Date: 12/8/14

Reviewed By: Lindsey Roberts McKenzie Date: 12/8/14

Reviewed By: Rebecca Nestingen Date: 12/8/14

Reviewed By: Brad Woznak Date: 12/8/14

Short Elliott Hendrickson Inc.
3535 Vadnais Center Drive
St. Paul, MN 55110-5196

I-35W Corridor Drainage Study
Preliminary Drainage Report
Hennepin County, Minnesota

Hennepin County Project No. 9864-01
MnDOT Project No. 2782-327
SEH No. HENNC 113114, 123521

December 8, 2014

I hereby certify that this report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Justin T. Klabo, PE
Senior Water Resources Engineer

Date: 12/8/14 Lic. No.: 48701

Reviewed By: Ron Leaf Date: 12/8/14

Reviewed By: Rocky Keehn Date: 12/8/14

Reviewed By: Lindsey Roberts McKenzie Date: 12/8/14

Reviewed By: Rebecca Nestingen Date: 12/8/14

Reviewed By: Brad Woznak Date: 12/8/14

Short Elliott Hendrickson Inc.
3535 Vadnais Center Drive
St. Paul, MN 55110-5196

This Page Left Blank Intentionally

Distribution List

No. of Copies	Sent to
1	James Grube, PE Hennepin County A-2303 Government Center Minneapolis, MN 55487-0233
1	Scott Pedersen MnDOT – Metro Resource Selection – Pre-Design 1500 West County Road B2 Roseville, MN 55113
1	Jenifer Hager City of Minneapolis – Department of Public Works 309 2nd Ave. S., Room 300 Minneapolis, MN 55401
1	Bruce Irish MnDOT – Metro District Water Resources Engineering 1500 West County Road B2 Roseville, MN 55113
1	Jim Harwood Metro Transit – Engineering & Facilities 560 Sixth Avenue North Minneapolis, MN 55411

This Page Left Blank Intentionally

Executive Summary

The Preliminary Drainage Report for the Interstate Highway 35W (I-35W) Corridor Drainage Study provides a preliminary design document addressing the stormwater treatment and rate control needs directly related to the proposed improvements. The report also details which local, state and Federal requirements the project is meeting and which requirements a design exemption is needed for. The Preliminary Drainage Report provides an overall preliminary design document that can be used for the final design of each roadway project segment.

The three roadway project segments within the overall Study Area include the following:

- 94 Commons Area – Including the work proposed on I-94, from I-94 to approximately E. 26th Street.
- Transit/Access Area – Approximately E. 26th Street to E. 32nd Street.
- Gap Area – Approximately E. 32nd Street to E. 42nd Street.

The Transit/Access and Gap segments propose to increase the amount of impervious surface area by 8.4 acres and 1.2 acres respectively. The 94 Commons segment proposes to reduce the amount of impervious surface area by 0.5 acres. Overall the three segments together increase the impervious surface area by 9.1 acres.

I-35W within the Study Area experiences flooding at three major low points: 35th Street, 42nd Street and 46th Street. Each of these sag points is located within the tunnelshed of the I-35W Tunnel. The I-35W tunnel starts at approximately 39th Street on I-35W, extends north under I-35W, ultimately discharging into the Mississippi River at the I-35W Bridge. The cause of the flooding at these sag points has been identified as limited capacity within the I-35W Tunnel based on several past studies completed for the tunnelshed. The scope of this Study does not include developing solutions for the current flooding conditions that exist within the tunnelshed. The scope of this Study is to meet the requirements as outlined in this report and overall to not cause exacerbate the existing flooding conditions. In addition, the results of this Study are not intended to facilitate the removal of existing orifice restrictions from connections of Minneapolis neighborhoods or Lake Street.

All three project segments are under the jurisdiction of the same three organizations; (1) Mississippi Watershed Management Organization (MWMO), (2) the Minnesota Pollution Control Agency (MPCA) General Permit and (3) the City of Minneapolis (City). Each entity has adopted stormwater requirements, requiring the treatment and control of stormwater runoff. Stormwater Best Management Practices (BMPs) have been integrated into the Study Area based on the most stringent standards from these agencies.

The standards provided below summarize the most stringent standards that the Study Area has been investigated from and designed to.

- Water Quality – Retain onsite the first inch of runoff from the net new impervious surface areas (MPCA). In addition, treat the overall corridor to remove 90% of Total Suspended Solids (TSS) from stormwater runoff (MWMO).
- Rate Control – The proposed cumulative discharge rates at the drop shaft locations shall not exceed the existing cumulative discharge rates (MWMO and City).
- Localized Flooding – No increase in flooding depths for areas that currently experience flooding for the 100-year design storm event using Atlas 14 rainfall depths and distributions. Flooding is defined as the point when water exceeds the elevation of the drainage casting (project goal).

The linear corridor poses a challenge for the type of BMPs that can be utilized to meet the overall design requirements. A comprehensive list of BMPs were developed to serve as the starting point for determining the most feasible BMPs for the Study Area. BMPs were evaluated, weighed against each other and discussed

during the monthly meetings. Ultimately, two types of BMPs were selected as the most favorable BMPs to meet the stormwater requirements.

- Filtration Basins
- Structural Pollution Control Devices (SPCDs)

Filtration basins are proposed to meet the requirements of the MPCA Construction Stormwater Permit. Soils investigation work was completed within the vicinity of the 33rd St. Basin (see Appendix G). The soils were found to be predominantly sand however there was a lens of lean clay found approximately at the basin bottom. MnDOT has developed a technical memorandum (TM No. 14-06-ENV-01) outlining allowable infiltration locations along MnDOT roadways. The stormwater treatment areas were selected to be filtration basins as a conservative estimate based on the varying soils information obtained. If soil conditions deemed acceptable for infiltration after further analysis and the basin is located outside of the exclusionary zone as outlined in the technical memorandum, the basins could be redesigned to be infiltration basins by either removing the draintile or installing a gate valve on the draintile to control the discharge of stormwater through the draintile. The filtration basins serve as the primary treatment method to meet the MPCA stormwater requirements. The filtration basins are integrated into the roadway design by functioning as a linear basin situated between I-35W and adjacent frontage roads. The filtration basins were designed to have a larger treatment capacity than what is required by the MPCA. Therefore the filtration basins also are able to meet a portion of the MWMO goal of retaining storm water and treating it to meet the 90% TSS removal requirement.

The SPCDs are designed to treat stormwater to meet the remaining TSS removal goal (MWMO water quality goal) that was not met by the filtration basins. The SPCDs are proposed to be located in shoulder areas to allow for easier access for maintenance and inspection activities.

Overall the approach was to use filtration basins and SPCD's to meet the water quality treatment goals of the project. Knowing that SPCD's have a maximum TSS removal efficiency of approximately 70%, the design had to supplement the SPCD's with another type of BMP to obtain the goal of 90% TSS removal over the Study Area per the MWMO requirement. This was through the use of filtration basins. In addition, the SPCD's treated stormwater runoff from the project right-of-way as well as offsite areas. Because the tunnel and associated dropshafts are located primarily within the I-35W Corridor, offsite storm sewer systems discharge to the storm sewer systems on I-35W. Therefore the contributing drainage areas to some of the SPCD's located within the project also include offsite areas based on the storm sewer system layouts.

The public right-of-way within the Study Area limits the available area to construct retention features to maintain the existing peak discharge rates and not exacerbate existing flooding conditions within the Study Area. The filtration basins designed to meet the water quality goal were also designed to attenuate the peak flow rates of the stormwater runoff and not exacerbate the existing flooding elevations throughout the system.

Knowing that areas throughout the tunnelshed and within the Study Area flood under existing conditions, the project design criteria had to be set with the tunnel capacity issues in mind. Therefore the following were applied to the Study Area:

- Areas that flood during the existing conditions 100-year event – no increase in the HWL
- Areas with freeboard for the existing conditions 100-year event – no flooding (HWL rises above the top of casting)
- Areas with freeboard for the existing conditions 50-year event – maintain 0.5 feet of freeboard

The two proposed filtration basins were analyzed within the proposed XP-SWMM model to determine the rate control and flooding impacts. The proposed conditions high water levels, peak discharge rates and flooding impacts were evaluated in conjunction with the design standards. While the addition of the filtration basins did mitigate high water level increases in general throughout the project, there were a number of areas where storm sewer improvements were necessary to meet the localized flooding design requirement. These

improvements consisted of lowering storm sewer because of roadway profile adjustments and upsizing existing storm sewer. The localized flooding criteria was met by controlling the stormwater from the project by utilizing filtration basins for storage and rate control.

Overall the project was able to meet the rate control and high water level requirements by storing and controlling the rate of discharge from the filtration basins. The storage volume provided in the filtration basins for the 100-year event is approximately 3.5 acre-feet. The runoff volumes generated during a 100-year event for a fully pervious and impervious condition were compared against this storage volume. The basins are able to store and control the runoff because all of the runoff is directed into the basins and the high flows are not routed around the basins.

- 9.1 acres of pervious surface area (CN 69) yields 2.9 acre-feet of runoff
- 9.1 acres of impervious surface area (CN 98) yields 5.4 acre-feet of runoff.

Based on the 100-year runoff volumes, there is an additional 2.5 acre-feet of runoff from the impervious surface area. With the basins 100-year live storage capacity greater than the additional runoff generated by the impervious surface area, the basins are able to control the discharge rates and HWLs to meet the design requirements.

Table of Contents

Letter of Transmittal
Certification Page
Distribution List
Executive Summary
Table of Contents

Page

1.0 Introduction 1
1.1 Purpose 1
1.2 Study Area Background 1
1.3 Previous Investigations 2
1.3.1 I-35W and St. Mary's Storm Tunnel Study, SRF Consulting Group Inc. (2006) . 2
1.3.2 West Lake Stormwater Analysis, SRF Consulting Group Inc. (2006) 3
1.4 Study Area Description 4
1.4.1 94 Commons 4
1.4.2 Transit/Access 4
1.4.3 Gap 4
2.0 Project Criteria and Design Approach 6
2.1 Design Approach 6
2.2 Project Criteria 6
2.2.1 Water Quality 6
2.2.1.1 MWMO 6
2.2.1.2 MPCA / NPDES Construction Permit 7
2.2.1.3 City of Minneapolis 7
2.2.2 Rate Control 7
2.2.2.1 MWMO 7
2.2.2.2 MPCA / NPDES Construction Permit 7
2.2.2.3 City of Minneapolis 7
2.2.3 Localized Flooding 7
2.3 Design Approach Summary 8
2.3.1.1 Water Quality 9
2.3.1.2 Rate Control 9
2.3.1.3 Localized Flooding 9
3.0 Methodology 10
3.1 Data Acquisition 10
3.1.1 Data 10
3.1.2 Design Rainfall and Distribution 10
3.1.3 Proposed Roadway Design Data 10
3.1.4 Previous XP-SWMM Model 11
3.1.5 As-Built Drawings 11
3.2 Hydrology and Hydraulics 11
3.2.1 Modeling Software 11
3.2.1.1 ArcGIS-ArcMap 11
3.2.1.2 HydroCAD® 11
3.2.1.3 Geopak SITE 12
3.2.1.4 XP-SWMM 12

SEH is a registered trademark of Short Elliott Hendrickson Inc.

Table of Contents (Continued)

3.2.2 XP-SWMM Model Development 12
3.2.2.1 Hydrology 13
3.2.2.1.1 Routing Method 13
3.2.2.1.2 Rainfall 14
3.2.2.1.3 Infiltration 14
3.2.2.1.4 Proposed Drainage Areas 15
3.2.2.2 Hydraulics 15
3.2.2.2.1 Hydraulic Parameters 15
3.2.2.2.2 Stormwater Conveyance 15
3.2.2.2.3 Surface Storage 16
3.2.2.3 Calibration 16
3.3 Best Management Practices Selection 16
3.3.1 BMP Review 17
3.3.1.1 BMP Location Criteria 17
3.3.1.2 Preliminary BMP Investigations 17
3.3.1.2.1 HydroCAD® Modeling 17
3.3.1.2.2 Preliminary Infiltration Investigation 17
3.4 Water Quality Analysis 18
3.4.1 Modeling Software 18
3.4.1.1 Sizing Hydrodynamic Separators and Manholes 18
3.4.1.2 P8 18
3.4.2 Basin Sizing 18
3.4.3 SPCD Selection 18
3.4.4 SPCD Design 18
3.4.5 Particle Distribution 19
3.4.6 Impervious Area Calculations 19
3.4.7 Hydraulic Length Verification 20
4.0 Existing Conditions 21
4.1 Site Characteristics 21
4.2 Critical Locations 21
4.3 Historic Flooding Issues 22
4.4 Existing Water Quality 22
4.5 Existing Conditions Model Development 22
4.5.1 Results 23
4.6 Existing Conditions Discharge Rates 24
4.6.1 Results 25
5.0 Proposed Conditions 26
5.1 Design Considerations 26
5.1.1 Project Wide 26
5.1.2 94 Commons 26
5.1.3 Transit/Access 26
5.1.4 Gap 26
5.2 Project Impacts 27
5.2.1 Water Quality 27
5.2.2 Rate Control 28
5.2.2.1 94 Commons 28

Table of Contents (Continued)

5.2.2.2 Transit/Access 28
5.2.2.3 Gap 28
5.2.3 High Water Levels 28
5.2.3.1 94 Commons 29
5.2.3.2 Transit/Access 29
5.2.3.3 Gap 29
5.3 Recommended Stormwater Features 29
5.3.1 Project Wide 29
5.4 Proposed Conditions Results 31
5.4.1 Water Quality 31
5.4.1.1 94 Commons 33
5.4.1.2 Transit/Access 33
5.4.1.3 Gap 33
5.4.2 Rate Control 33
5.4.2.1 Proposed Model development 33
5.4.2.2 94 Commons 36
5.4.2.3 Transit/Access 37
5.4.2.4 Gap 37
5.4.3 High Water Levels 37
5.4.3.1 94 Commons 41
5.4.3.2 Transit/Access 41
5.4.3.3 Gap 41
6.0 Final Design Considerations 42
6.1 Preliminary Cost Estimate 42
6.2 Soil Borings 42
6.3 Detailed Survey 42
6.3.1 Topography 42
6.3.2 Utilities 43
6.4 Drainage System Design 43
6.5 SPCD Maintenance 43
6.6 I-35W Tunnel System 44
6.6.1 On Going Analysis 44
6.6.2 Future Model Use 44
7.0 References 45

Table of Contents (Continued)

List of Tables

Table 1 Data Source....10
Table 2 Existing Conditions Model Updates....13
Table 3 Hydrologic Inputs....14
Table 4 Synthetic Storm Data....14
Table 5 Hydraulic Parameters....15
Table 6 Existing Corridor Impervious....21
Table 7 Existing Conditions Model Progression....23
Table 8 Comparison of 100-yr High Water Levels....24
Table 9 Existing Conditions Discharge Rates Results....25
Table 10 Project Impervious Impacts....27
Table 11 Project Wide TSS Loading....27
Table 12 MWMO Goal....27
Table 13 NPDES Water Quality Volume Standard....28
Table 14 Stage Storage 24th Street Basin....30
Table 15 Stage Storage 33rd Street North Basin....30
Table 16 Stage Storage 33rd Street South Basin....30
Table 17 SAFL Baffle® Placement....31
Table 18 Proposed Basin Water Quality Volume....32
Table 19 Project Wide SPCD TSS Removals....33
Table 20 Proposed Conditions Model Progression....34
Table 21 Proposed 2-Year Discharge Rates Results....35
Table 22 Proposed 10-Year Discharge Rates Results....35
Table 23 Proposed 50-Year Discharge Rates Results....36
Table 24 Proposed 100-Year Discharge Rates Results....36
Table 25 Proposed 100-year High Water Level Summary....38
Table 26 Proposed Conditions Drawdown Times....39
Table 27 Proposed Conditions High Water Levels....40
Table 28 Proposed Storm Sewer Improvements....41
Table 29 Preliminary Cost Estimate....42
Table 30 SPCD Location Information....44

Table of Contents (Continued)

List of Appendices

Appendix A	Figures
Appendix B	Analysis Calculations and Detailed Results
Appendix C	Agency Memorandums
Appendix D	Correspondence
Appendix E	Stakeholder Meeting Minutes
Appendix F	Stakeholder Comments with Responses
Appendix G	Project Data (CD)
Appendix H	XP-SWMM Model (CD)
Appendix I	Recommended Product Data Sheets
Appendix J	Preliminary Cost Estimate

Preliminary Drainage Report

I-35W Corridor Drainage Study

Prepared for Hennepin County City of Minneapolis
and the Minnesota Department of Transportation

1.0 Introduction

1.1 Purpose

The Preliminary Drainage Report for the Interstate Highway 35W (I-35W) Corridor Drainage Study provides a preliminary design document addressing the stormwater treatment and rate control needs directly related to the proposed improvements, analyses performed and key design elements.

The Preliminary Drainage Report developed for the I-35W Corridor Study includes the 94 Commons, Transit/Access and Gap roadway project segments.

I-35W within the Study Area experiences flooding at three major low points: 35th Street, 42nd Street and 46th Street. Each of these sag points is located within the tunnelshed of the I-35W Tunnel. The I-35W tunnel starts at approximately 39th Street on I-35W, extends north under I-35W, ultimately discharging into the Mississippi River at the I-35W Bridge. The cause of the flooding at these sag points has been identified as limited capacity within the I-35W Tunnel based on several past studies completed for the tunnelshed. The scope of this Study does not include developing solutions for the current flooding conditions that exist within the tunnelshed. The scope of the Study is to meet the requirements as outlined in this report and to not exacerbate the existing flooding conditions. In addition, the results of this Study are not intended to facilitate the removal of existing orifice restrictions from connections of Minneapolis neighborhoods or Lake Street.

1.2 Study Area Background

The I-35W Corridor Drainage Study Area (Study Area) is located entirely in Minneapolis, Minnesota. The Corridor Study Area encompasses approximately 141 acres of I-35W roadway corridor (Corridor), stretching from the 94 Commons area south to 42nd Street (see Figure 1 for Project location). The Corridor is within the Upper Mississippi River Basin and ultimately drains to the Mississippi River.

I-35W and I-94 are an integral part of the urban highway system in the Twin Cities Metropolitan Area. I-35W was constructed through south Minneapolis as a part of the Interstate Highway System in the early 1960s. The Corridor is one of the highest average daily traffic volume corridors in the State of Minnesota. The area along the Corridor is fully developed with residential and commercial development. These interstates provide access to the Central Business District (CBD) of Minneapolis as well as serving interregional through

trips. Local traffic traveling between surrounding communities, commercial developments, and industrial centers are also served by this interstate system.

The entire Corridor ultimately drains to the I-35W Tunnel (Tunnel). The overall tunnelshed of the I-35W Tunnel extends on I-35W from I-94 to Minnehaha Creek and includes the surrounding neighborhoods along I-35W. The Tunnel runs from south to north under the I-35W Corridor from 39th Street to the intersection of I-35W and I-94 to the Mississippi River. This intersection is the junction of the I-35W Tunnel and a second 9-foot diameter tunnel running from west to east along the I-94 Corridor (I-94 Tunnel). The I-94 Tunnel runs from a dropshaft southeast of Loring Park to the junction of the two tunnels at Portland Avenue and 18th Street. Downstream of this intersection, the tunnel runs northeast following I-35W until it reaches its ultimate discharge point and system outfall, the Mississippi River. Both tunnels, I-35W Tunnel and I-94 Tunnel, drain an area of approximately 4.9 square miles (approximately 3,136 acres). MnDOT right-of-way contributes approximately 305 acres of the 3,136 acres and the remaining 2,831 acres is contributed from areas within the City of Minneapolis. The percentage split between contributing drainage area from MnDOT and within the City of Minneapolis are approximately 10% and 90% respectively. (SRF Consulting Group Inc., 2006). See Figure 2 for the Study Area and Figure 3 for the Existing Conditions Drainage Areas.

Surface flooding within the tunnelshed and surrounding neighborhoods has historically been a problem. Within the last two decades the Tunnel has experienced pressure flow conditions, geysering and excessive surcharging. Although many studies have been conducted on the overall tunnelshed hydraulic infrastructure and specifically the Tunnel, a solution to the major flooding problem and tunnel pressurization has not been implemented at this time. The studies analyzing the capacity of the Tunnel have determined the Tunnel is undersized based on the contributing drainage area.

1.3 Previous Investigations

The drainage system for the Corridor has been investigated by many different agencies analyzing the watershed's hydrologic and hydraulic response to various storm events. These previous investigations were an important resource and provided a foundation for SEH to develop this Preliminary Drainage Study.

The primary focus of the past studies was to analyze the dynamics of the tunnelshed, determine the cause of the flooding and identify mitigation measures for the flooding. This Preliminary Drainage Study is intended to look at the proposed corridor improvements and impacts that they have to the overall system and it does not address the overall flooding and pressurization issues that have been well documented in past studies.

Additional studies beyond those listed below have been completed for the tunnelshed. The prior studies are listed in the *I-35W and St. Mary's Storm Tunnel Study* developed by SRF Consulting Group Inc. (SRF) in 2006. A summary of the previous investigations relating to the contributing tunnelshed for the Corridor is provided below.

1.3.1 I-35W and St. Mary's Storm Tunnel Study, SRF Consulting Group Inc. (2006)

The City of Minneapolis (City) and the Minnesota Department of Transportation (MnDOT) collaborated with SRF to develop a study on the flooding problems in both the I-35W and St. Mary's Tunnel systems. The study was done because of the following hydraulic issues in the I-35W Corridor:

- Flooding at seven defined locations identified in the 1997 Minneapolis Flood Report
- Flooding on I-35W at the 42nd and 46th Street low points

- 35th Street dropshaft 'geysering'
- Surcharging of the I-35W Tunnel
- Structural integrity deterioration of the I-35W Tunnel

A detailed model was developed for both the I-35W and St. Mary's tunnel systems to determine the extent of the existing flooding condition along with developing potential solutions to the flooding problem. The St. Mary's Tunnel was included in the study because of its close proximity to the I-35W Tunnel and the "potential for a combined solution." The hydrologic and hydraulic modeling was done in XP-SWMM in 2006.

The results of the existing conditions analysis displayed significant flooding at the major sag points on I-35W. At two true sag points along I-35W, as defined by MnDOT, the 42nd St. sag point flooded to a depth of over 5 feet and the 46th St. sag point flooded to a depth of nearly 2 feet during the 100-year rainfall event (using TP 40 rainfall depths). These "true sag points" on I-35W have the potential for severe injury or loss of life to occur during a severe rainfall event.

The flooding throughout the I-35W tunnel system was found to be caused by lack of conveyance within the tunnel. This along with entrained air within the system are the primary causes of the flooding and geysering experienced along the I-35W corridor and throughout the City of Minneapolis.

As a result of this severe flooding occurring within a highly urbanized area, the study considered over 21 potential solutions to mitigate the flooding. Through a Technical Advisory Committee (TAC) formed between City and State along with consulting firms, two primary flooding mitigation measures considered.

- Increase tunnel capacity (conveyance) or
- Add storage/peak attenuation into the system (storage).

Ultimately the conveyance option recommended was to construct a 19-diameter tunnel which would replace the St. Mary's tunnel and run parallel with the I-35W tunnel. The preferred storage option was to construct deep caverns below I-35W to detain and control the discharge of stormwater. For the storage option, the existing tunnel would be maintained. Either option was found to mitigate the flooding along I-35W and within the City of Minneapolis but both come with a substantial investment and overall price tag (in 2006 dollars).

- Conveyance Option – Estimated Cost $69.3 million
- Storage Option – Estimated Cost $56.2 million

For both options, the I-35W tunnel would need to be rehabilitated and the costs included above reflect this. Overall the cost to reduce the risk of flooding on I-35W and surrounding City areas is a large capital improvement with a significant cost.

1.3.2 West Lake Stormwater Analysis, SRF Consulting Group Inc. (2006)

SRF and Hennepin County (County) conducted a study of the West Lake Street system connecting into the I-35W Tunnel at the 31st Street dropshaft. The Study Area was from West Lake Street (County State Aid Highway (CSAH) 3) from Dupont Avenue South to Blaisdell Avenue South, and was conducted as part of the West Lake Street Reconstruction Project. As part of the study, the XP-SWMM model created for the 2006 I-35W and St. Mary's Storm Tunnel Study was used to simulate the existing, interim and proposed conditions of the site. The study concluded that the existing trunk storm sewer line is significantly undersized. The

preferred alternative proposed by the study was the construction of an overflow bypass system combined with project wide storm sewer reconstruction, and the replacement of the St. Mary's Tunnel with a 19-foot diameter tunnel.

1.4 Study Area Description

In a series of actions taken by the Hennepin County Board of Commissioners, the Board has taken the lead in a partnership consisting of the County, City of Minneapolis, MnDOT and the Metropolitan Council for the improvement of transit service and mobility along I-35W in the vicinity of Lake Street (Hennepin County State Aid Highway 3). This partnership was first engaged through 2005 and was renewed in 2009. During the partnership's first engagement in the early 2000s, the county worked closely with then Congressman Martin Sabo to garner federal funds in support of the project.

The development of an improved transit service corridor has led to the development of three separate roadway projects within the I-35W corridor. From a roadway design and agency perspective, these are considered individual projects. However from a stormwater and drainage system perspective, these three distinct projects are grouped together into one overall Study Area as a result of the overall system dynamics. The three roadway improvement projects along I-35W are as follows:

1.4.1 94 Commons

The 94 Commons project segment consists of the I-94 and I-35W Interchange and south on I-35W to approximately East 26th Street.

MnDOT, in coordination with Hennepin County, the City of Minneapolis and Metro Transit is completing engineering work for the replacement of two Chapter 152 Bridges (the I-35W "braid" bridge and the I-35W "flyover" bridge connecting I-35W northbound to I-94 westbound). These bridges are required to be replaced by legislative action due to their condition. The replacement of these bridges results in the need for reconstruction work along I-35W between 26th Street and I-94. It is expected that this project will be constructed at the same time that the I-35W Transit/Access project is built. This work will also include the replacement of the 24th Street bicycle/pedestrian Bridge, the 26th Street Bridge, the Franklin Avenue Bridge, and bridges in the TH 65/I-35W/I-94 interchange area.

1.4.2 Transit/Access

The Transit/Access project segment is located on I-35W from the termination of the 94 Commons project segment at approximately East 26th Street to East 32rd Street.

Hennepin County, the City of Minneapolis, Metro Transit and MnDOT are planning the I-35W Transit/Access project in Minneapolis, which includes the Lake Street interchange area between approximately 32nd Street and 26th Street, a Bus Rapid Transit (BRT) station near Lake Street, and a high quality pedestrian/bicycle connection between the Midtown Greenway and Lake Street. This project includes a new southbound exit ramp from I-35W to Lake Street and a new northbound exit ramp from I-35W to 28th Street.

1.4.3 Gap

The Gap project segment extends from the termination of the Transit/Access project segment at East 32rd Street to East 42nd Street on I-35W.

There is a 1.3 mile section of freeway between the Crosstown Commons area and the Transit/Access project (approximately 42nd Street to 32nd Street) that is not planned for reconstruction. However, MnDOT is planning to do pavement replacement and other

rehabilitation work in this area at the same time that the Transit/Access project is constructed. A southbound MnPASS lane will be incorporated into the design to complement the existing transit station at 46th Street and the proposed transit station at Lake Street. No bridges will be replaced in this section and full reconstruction is not planned.

2.0 Project Criteria and Design Approach

2.1 Design Approach

The following design approach is used in the development of the preliminary drainage design for the Study Area:

- Improve water quality of stormwater runoff leaving the Study Area
- Maintain or reduce the discharge rate and volume of stormwater leaving the Study Area
- Maintain or reduce high water levels in the tunnelshed of the Study Area at all locations due to flooding during the 100-year event

These design components are common to multiple organizations. The detailed standards to which the drainage design will comply with are outlined in the following sections.

2.2 Project Criteria

Below are the stormwater regulations of the three organizations/agencies within the Study Area:

1. Mississippi Watershed Management Organization (MWMO)
    a. The MWMO Board reserves the right to review and comment on plans that affect the quality and quantity of water within and across its watershed and subwatershed boundaries. Any project creating greater than one acre of land disturbance is subject to the MWMO standards. The MWMO is not a permitting agency, and therefore relies on its member communities to address and regulate their policies, goals and standards
2. National Pollutant Discharge Elimination System (NPDES) permit program administered by the Minnesota Pollution Control Agency (MPCA)
    a. The MPCA regulates stormwater discharges associated with construction activity throughout Minnesota. The Permit is required for all construction activity that disturbs one or more acres of soil. Projects that ultimately create a new impervious surface area greater than one acre are required to provide permanent stormwater management.
3. City of Minneapolis (City).
    a. Following 2014 requirements, the City of Minneapolis requires Stormwater Management plans to be submitted and reviewed on all construction projects greater than one acre in size. These plans must follow the Minneapolis Code of Ordinance, Chapter 54, and can be found in section 54.70, Part 3.

Each organization has its own specific stormwater design standards. This section summarizes the standards of each agency and identifies the design approach for the overall Study Area that will be used to meet area requirements.

A memorandum summarizing the stormwater criteria for each agency was developed to establish design standards for the project. A copy of the correspondence between SEH and the organizations regarding the project design standards is included in Appendix C.

2.2.1 Water Quality

The water quality standards of the three organizations are shown below:

2.2.1.1 MWMO

According to documents provided by the MWMO, “Projects shall achieve a removal of 90% TSS (Total Suspended Solids) from the 95th percentile daily rainfall total, currently 1.17 inches over 24 hours over the entire site area, not just the areas of the site being developed

or disturbed (Mississippi Watershed Management Organization, 2014). The 95th percentile daily rainfall total will be updated based on the data provided in the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 8 per conversations with the MWMO. Compliance with the MWMO goal using infiltration is recommended, but not required.

2.2.1.2 MPCA / NPDES Construction Permit

A volume equal to one (1) inch of runoff from the net new impervious surfaces (water quality volume) created by the project must be retained onsite (i.e., infiltration or other volume reduction means). When infiltration is prohibited, the project water quality volume must be treated by a Best Management Practice (BMP) (Minnesota Pollution Control Agency, 2014). BMPs include wet sedimentation basins, filtration systems, regional ponding, or equivalent methods prior to the discharge of stormwater to surface waters.

Situations that prohibit infiltration include: close proximity to bedrock or groundwater, poorly draining soils, and the presence of contaminated soils.

2.2.1.3 City of Minneapolis

Based on the current standards, the City of Minneapolis requires specific water quality standards based on the project's individual receiving water. At a minimum, all receiving waters within the City shall remove 70% of the total suspended solids (TSS) from the net new impervious surface area (City of Minneapolis, 2014). The Mississippi River is the receiving body of water for the I-35W corridor. This receiving water has no further water quality requirements. The use of infiltration to meet the water quality requirement is recommended, but not required. The City Code of Ordinance states "To the greatest degree (except in the case of stormwater hotspots), natural drainage ways and vegetated soil surfaces should be used to convey, store, filter, and retain stormwater before discharging runoff into public waters or the public drain system."

2.2.2 Rate Control

The rate control standards of the three organizations are shown below:

2.2.2.1 MWMO

The Watershed Management Plan states that proposed peak runoff rates "shall not exceed pre-development runoff rates for the Type II distribution 2-, 10-, and 100-year critical storm events" (as defined by TP- 40 and/or subsequent revisions, including NOAA Atlas 14) (Mississippi Watershed Management Organization, 2014). Pre-development is defined as existing site conditions.

2.2.2.2 MPCA / NPDES Construction Permit

The MPCA does not outline an all-encompassing, project-wide, rate control goal. However, discharge rates are regulated based on specific type of BMP used. Specifically, wet sedimentation basins must be designed such that the outlet's water quality volume is not discharged at greater than 5.66 cfs per acre of surface area of the pond (Minnesota Pollution Control Agency, 2014).

2.2.2.3 City of Minneapolis

The City of Minneapolis requires that "Development should be planned in a manner that does not increase peak flows" for the 2-, 10-, and 100-year 24 hour storm events (City of Minneapolis, 2014). The rate control standard is measured relative to existing site conditions.

2.2.3 Localized Flooding

As previously discussed, the projects are located within an area of I-35W that is prone to flooding during 5- and 10-year events. Flooding for the Study is defined as locations where

stormwater rises above the elevation of the grate, manhole or other drainage structure that causes a temporary ponding condition on the highway or street. The FHWA has established standards for Interstate systems (see below) as well as a memorandum (see Appendix C) outlining the capacity issues for the I-35W tunnel. The two main FHWA design criteria that apply to this section of I-35W are the following:

1. Spread – confine spread to the width of the shoulder for Interstate highways
2. Sag points - For sag points categorized as a true sag where 2 feet or more of flooding can occur, the spread for a 50-year event must be confined to the shoulder

As part of this project, the drainage system improvements for the three segments must be designed such that they do not exacerbate the flooding conditions that currently exist today. As a result of the limited capacity of the existing tunnel system and resultant flooding, the following design standards are to be followed.

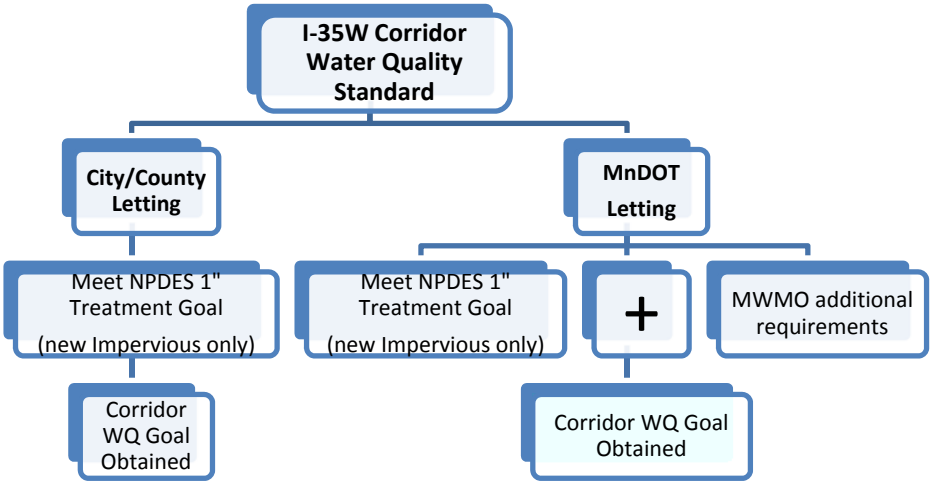
1. Areas that flood during existing conditions, 100-year or 50-year events: No increase in the existing flooding High Water Levels (HWL) during the 100-year or 50-year design storm events for structures that flood in existing conditions.
2. Areas with freeboard during existing conditions, 100-year event: no new flooding (HWL rises above the top of casting)
3. Areas with freeboard during existing conditions: Maintain a minimum of 0.5 feet of freeboard from the top of casting elevation during the 50-year design storm for all structures that do not flood under existing conditions. Freeboard is defined as the difference in elevation between the structure top of casting and the high water level, a negative freeboard depicts flooding.

2.3 Design Approach Summary

The City, County and MnDOT do not uniformly follow the same stormwater regulations. Each entity has a different policy in regards to following the goals adopted by the MWMO.

- The City and County follow their own standards and the MPCA requirements.
- MnDOT follows the MWMO standards and the MPCA requirements.

The standards that each roadway project segment must meet are based on who is letting the project. At this time it is not known who will let each of the three project segments. Therefore, at this preliminary design stage, the project design process has assumed the most conservative standards will apply. The flow chart below diagrams the design requirements based on who is the letting agency.



Only the water quality standard will vary based on which agency lets the project. The rate control and volume control standards are the same goal regardless of the letting agency. The design approach for each standard is described below.

2.3.1.1 Water Quality

Based on NPDES Permit requirements the Study Area will need to retain onsite a water quality volume equal to one inch of rainfall over the net new impervious surface area. This is the only goal that would need to be met if the City and County let the project.

Based on the MWMO goals, the project must achieve a removal of 90% of the Total Suspended Solids (TSS) from the 95th percentile daily rainfall total (currently 1.17 inches in 24 hours, provided by the MWMO) over the entire area of the site, not just areas of the site being developed or disturbed.

If MnDOT lets the project, the NPDES standards for the net new impervious surface area (retaining 1" of runoff) would need to be met. In addition, the MWMO goal for the entire site, 90% TSS removal, would also need to be met. Since some TSS would be retained in the 1" of runoff being retained from the NPDES requirement, the remaining treatment needed would be the MWMO goal minus the NPDES standard amount.

2.3.1.2 Rate Control

Discharge rates for the Study Area may not exceed existing runoff rates for the 2-, 10-, and 100-year critical storm events using the nested distribution and rainfall depths as defined by NOAA Atlas 14, Volume 8.

2.3.1.3 Localized Flooding

Overall the project is being designed to maintain existing conditions and not to cause an adverse condition to the overall drainage system. The Study is not intended to fix the known capacity issues of the Tunnel or the existing highway and local flooding.

1. High Water Levels (HWLs)
    a. Areas flooding during existing conditions – No increase to flooding depths
    b. Areas without flooding during existing conditions – Proposed HWLs shall not exceed the top of casting (no new flooding)
2. Trunk Storm Sewer (for areas not flooding under existing conditions)
    a. A minimum of 0.5 feet of freeboard from the top of casting elevation during the 50-year design storm for the structures that do not flood under existing conditions. Freeboard is defined as the difference in elevation between the structure top of casting and the high water level, a negative freeboard depicts flooding.
3. Allowable Roadway Spread
    a. The roadway segments will need to be designed to accommodate the FHWA's requirements for confining spread to the shoulder for a 10-year and 50-year event (at true sag points). Even though various sag points flood for either or both of these events, it is recommended to install the necessary amount of catch basins within the shoulder to capture runoff and meet spread assuming a free discharge condition. That way when improvements to the tunnel system are completed the roadway will be able to meet the current design standards.
    b. Since a solution to the tunnel flooding will not be implemented in conjunction with any future projects identified with this study, a design exemption is needed for the FHWA requirement of confining spread to the shoulder during a 50-year event at true sag points.

3.0 Methodology

This section outlines the methodology for both existing and proposed conditions. The systematic approach of data acquisition, hydrology and hydraulics, best management practice selection, and water quality analysis is described below. Hydrologic and hydraulic modeling was conducted to analyze rate control and high water level impacts. Water quality modeling was conducted to analyze the existing loading generated by the Corridor and analyze the proposed BMPs to determine the amount of pollutants removed by the BMPs.

3.1 Data Acquisition

3.1.1 Data

Spatial data was collected from a variety of sources to develop and analyze the hydrologic and hydraulic conditions of the system. The data was collected and processed using ArcGIS software. A description of the data collected, the source and its use is provided in Table 1.

Table 1
Data Source

Data	Source	Date	Use
2-ft Contour Data	Minnesota Department of Natural Resources LiDAR	2011	Watershed delineation and slope calculation
Existing Storm Sewer Data – Project Wide	City of Minneapolis	Varies	System hydraulics verification, proposed feature design
Existing Storm Sewer Data-Within Corridor	MNDOT – HydInfra Database	2013	System hydraulics verification, proposed feature design
Existing Drainage Areas	City of Minneapolis	2013	Used to develop Existing Conditions XP-SWMM Model
Existing Roadway	MnDOT	Varies	Mapping
Proposed Roadway	SEH Inc.	2014	Roadway geometrics used to calculate impervious area impacts
Drinking Water Supply Management Area	Minnesota Department of Health	January 2013	Verification that project has no conflict with DWSMA

3.1.2 Design Rainfall and Distribution

The NOAA Atlas 14, Volume 8 rainfall depths were used for the Study. The rainfall data was acquired from the NOAA Precipitation Frequency Data Server, and was taken at the following location: Minneapolis, Minnesota, US, Coordinates: 44.9565, -93.2712, Elevation: 884 feet. The nested distributions for the 2-, 10-, 50- and 100-year storms were developed using consistent methodology to the MnDOT process in the Technical memorandum, Atlas 14 – Precipitation Data Frequency Server Rainfall Distributions (MNDOT, 2014).

3.1.3 Proposed Roadway Design Data

In conjunction with the I-35W Corridor Drainage Study, SEH has developed a preliminary roadway design for each of the three separate roadway project segments within the I-35W Corridor. The roadway design files used were in .DGN file format, and developed in Bentley Systems MicroStation V8i. The following .DGN files were used to develop the proposed stormwater feature alternatives in GeoPAK SITE.

- Proposed Roadway Profile
- Proposed Roadway Geometrics

- Proposed Roadway Cross Sections
- Proposed Project Right of Way (ROW)
- Proposed Roadway Alignment

3.1.4 Previous XP-SWMM Model

The base model used for existing conditions was obtained from the City of Minneapolis. This comprehensive hydrologic and hydraulic model spans the entire I-35W tunnel watershed and includes all mainline city streets and storm sewer conduits. The base model was developed for previous studies of flooding within the tunnel watershed. This model was updated to better represent known existing drainage features in the tunnel watershed at the time of this study. See Table 7 for a list of model iterations and definitions.

3.1.5 As-Built Drawings

Existing as-built drawings were obtained from the City of Minneapolis, Hennepin County and from MnDOT. They were used to verify existing storm sewer inverts, size, routing and location throughout the Corridor. They were also used for detail modeling of the existing surge chambers that were added to the Corridor in 2008.

3.2 Hydrology and Hydraulics

The first step in the modeling process was to update the base model received by Minneapolis to create a new baseline existing conditions model. To develop this existing conditions model a series of analyses were carried out comparing the TP 40 rainfall depths to the Atlas 14 rainfall depths. The results of this analysis can be seen in Section 3.2.2 below. This process was completed to provide a clear depiction of how the results changed with the use of Atlas 14 data and other updates.

The next step, the rate control and flood mitigation design was analyzed with an iterative approach that compared the existing conditions model to a series of proposed conditions models. After the existing conditions model it was updated with roadway impervious area and profile elevation changes. This proposed conditions model was used to calculate the project impact on peak flow rates and high water levels without any rate control or treatment features in place. Finally, this proposed model was updated with rate control features that were designed to mitigate the proposed project impacts.

3.2.1 Modeling Software

Multiple modeling software programs were used in conducting the analysis for the hydrology and hydraulics calculations including ArcGIS, HydroCAD®, Geopak SITE, and XP-SWMM. These programs were used to determine the existing watershed parameters, as well as the hydrologic and hydraulic conditions of the system as described in the following paragraphs.

3.2.1.1 ArcGIS-ArcMap

ArcGIS is a collection of geographic information system (GIS) software programs created by the Environmental System Research Institute, Inc. (ESRI) utilized in the compilation and management of geospatial data, as well as for creating and sharing maps consisting of geospatial data. The ArcGIS program, ArcMap, Version 10.1, was used to analyze and create drainage areas, analyze storm sewer networks and calculate hydrology parameters.

3.2.1.2 HydroCAD®

HydroCAD® is a computer-aided design software used for modeling stormwater runoff and evaluating stormwater management systems. HydroCAD®, Version 10.0 was used in preliminary design of proposed water quality and rate control features. HydroCAD® was used to calculate

runoff volumes based on the entire project ROW area for existing and proposed conditions. This provided a baseline in stormwater feature sizing. HydroCAD® was also used for preliminary outlet sizing of rate control features to provide a baseline for XP-SWMM modeling.

3.2.1.3 Geopak SITE

Geopak SITE is design software within Bentley Geopak Civil Engineering Suite. Geopak is a 3D drafting, design and mapping software developed by Bentley Systems Incorporated. Geopak SITE is a feature-based surface model that enables users to develop triangulated surfaces for both existing ground and proposed design. Bentley Geopak V8i (SELECTseries 2) was used to design the proposed filtration basins within the roadway corridor. The stage storage relationship developed in SITE was used as an input into the XP-SWMM proposed model.

3.2.1.4 XP-SWMM

XP-SWMM is a comprehensive software package for dynamic modeling of stormwater, sanitary or combined systems, and river systems. XP-SWMM is developed by XP Solutions Inc. and has many applications, including stormwater management, 1D/2D urban flooding, detention pond optimization and BMP analysis. XP-SWMM, Version 2012 was used to dynamically model the complex urban drainage system, allowing for the interaction of overland flow and subsurface flow. XP-SWMM was used to analyze the project impacts and proposed solutions to runoff rates and localized flooding issues.

3.2.2 XP-SWMM Model Development

The base XP-SWMM model acquired from the City of Minneapolis was used as the base model to develop an existing conditions model for this study. The base model underwent a detailed review by SEH to ensure it represented known hydrologic and hydraulic conditions within the I-35W Corridor to date. Table 2 includes all updates that were made to the base model. The updates were made to ensure the base model was reviewed and updated to meet the following criteria:

- The tunnel watershed drainage area boundary matches the 2-foot LiDAR contours.
- The XP-SWMM drainage areas matched the GIS drainage areas provided by the City of Minneapolis.
- The model includes storm sewer 24-inches in diameter and greater within the I-35W Corridor Study Area.
- The model provides drainage areas delineated on a trunk storm sewer line basis to provide adequate hydrologic detail within the I-35W Corridor Study Area.
- Any known storm sewer improvements (including pipes, weirs and orifices) that have been made within the corridor to-date are included within the model.
- The model uses NOAA Atlas 14 rainfall depths and nested distributions.
- Ponding controls in the model reasonably represent an urban drainage system.
- Localized low points in the model are represented with a storage node.

Table 2
Existing Conditions Model Updates

Model Feature	Update Made[1]	XP-SWMM Location	Modeling Notes
Surge Chambers	Surge chambers added	Node-39th Street	Modeled as underground storage nodes, design details sourced from MNDOT As-built Plans
		Node-35th Street	
Drainage Areas	Drainage areas added in Corridor to increase detail	See Table B1 in Appendix B for Drainage Area updates	Updated impervious percent, slope, width and area within runoff nodes
	Updated Watershed boundary	See Table B1 in Appendix B for Drainage Area updates	N/A
	XP-SWMM Node Names changed to match GIS Shapefile	See Table B1 in Appendix B for Drainage Area Name updates	N/A
Storm Sewer	Trunk storm sewer lines added within Corridor	See Table B1 in Appendix B for Storm Sewer updates	Considered trunkline if >24-in in diameter, storm sewer modeled with combined roadway section
	Existing storm sewer line updates	See Table B1 in Appendix B for Storm Sewer updates	Existing storm sewer updates to fix modeling errors due to inconstant data
Storage	Storage Nodes added	See Table B1 in Appendix B for Storage node updates	Storage added to any node with > 4.0-ft flooding during "Sealed model run"[2]
Outfalls	Outfalls Added/Removed	See Table B1 in Appendix B for Outfall updates	N/A
Ponding	Ponding Allowed[3] toggled on	Entire model	No water is lost from the system in this case.
Rainfall	Updated with NOAA Atlas 14, Volume 8	Entire model	Model comparison made between TP-40 and NOAA Atlas-14, See Section 4.0

[1]Update made to the Minneapolis model in the development of the 2014 Existing Conditions (Atlas 14)
[2]Minneapolis model run with all nodes in sealed condition
[3]This option stores water above the spill crest and returns it to the same node as downstream conveyance capacity becomes available.

3.2.2.1 Hydrology

The XP-SWMM model was used to estimate the Study Area's peak runoff rates, runoff volumes and high water levels for selected critical frequency rainfall events. To estimate these parameters, it is important to utilize hydrologic methods that are appropriate for complex urban drainage. The following hydrologic methodologies were used to estimate existing and proposed runoff characteristics for the I-35W Corridor project. The hydrologic parameters used at each node in the in the I-35W Corridor are provided in Table B2 in Appendix B.

3.2.2.1.1 *Routing Method*

The SWMM Runoff methodology was used for hydrologic modeling of the Study Area. The SWMM Runoff methodology is a routing method used within XP-SWMM. The SWMM Runoff method was developed by the US Environmental Protection Agency (EPA) and is a physically based, discrete-time simulation model. Table 3 describes how each of the SWMM runoff methodology inputs were defined and calculated by SEH.

Table 3
Hydrologic Inputs

Input Parameter[1]	Definition	Calculation Methodology
Area	Drainage Area of subcatchment in acres	Existing drainage areas were based on the Minneapolis model. Proposed drainage areas were delineated using proposed roadway profile, cross sections and storm sewer
Impervious %	% of drainage area that consist of hydraulically directly connected impervious	Impervious % in areas outside of project boundary were taken from the City of Minneapolis model. Study Area % impervious was calculated using ArcGIS. See Table 10
Width	Area of the subcatchment divided by the average path length of overland flow.	Width in areas outside of project boundary were taken from the City of Minneapolis model. Within the Study Area, width was calculated using ArcGIS.
Slope	Elevation difference divided by the length of flow. (ft/ft)	Slope in areas outside of project boundary were taken from the City of Minneapolis model. Within the Study Area, slope was calculated using ArcGIS.

[1]The input parameters in Table 3 are computed

Source: Definitions taken from XP-SWMM 2012 Help File (XP Solutions, 2013)

3.2.2.1.2 *Rainfall*

The synthetic storm and runoff information used for hydrologic and hydraulic modeling were based on the project design requirements. The MWMO requires the use of a synthetic SCS Type II, 24-hour storm distribution. However, since the MWMO adopted this requirement, the Atlas 14 rainfall depths and nested distributions have been developed. Therefore the Atlas 14 rainfall depths and nested distributions will be used in the hydrologic and hydraulic analysis. The storm events that were evaluated were based on the project design requirements for rate control and flood control, and include the 2-, 10-, 50- and 100-year, 24-hour storm events.

The NOAA Atlas 14, Volume 8 Precipitation-Frequency Atlas was developed by NOAA and was used for the hydrologic analysis of the Study Area. The analysis process utilized the TP-40 and Atlas 14 storm depths to provide a comparison between the two different rainfall depth totals. Table 4 summarizes the synthetic storm data used in the hydrologic analysis.

Table 4
Synthetic Storm Data

Return Period (year)	Storm Duration (hour)	Rainfall Depth (inches)	Storm Distribution	Rainfall Data Source
100	24	5.90	SCS Type II	TP 40
2	24	2.85	Nested - Atlas 14	Atlas 14, V8
10	24	4.28	Nested - Atlas 14	Atlas 14, V8
50	24	6.39	Nested - Atlas 14	Atlas 14, V8
100	24	7.50	Nested - Atlas 14	Atlas 14, V8

3.2.2.1.3 *Infiltration*

The Green-Ampt infiltration method was used for hydrologic modeling of the Study Area. The average capillary suction was assumed 10 inches, and saturated hydraulic conductivity was assumed 0.25 inch/hour for all runoff nodes. These parameters were utilized in accordance

with the City of Minneapolis' XP-SWMM Hydrology and Hydraulics Development Guidance manual. According to the manual, because all of the rainfall events that were run greater than 0.5-inches the effect of infiltration is minimized, and soil samples are not required to determine the infiltration parameters (SRF, 2005).

3.2.2.1.4 *Proposed Drainage Areas*

Proposed drainage areas were delineated using the available two-foot LiDAR contour data in conjunction with the proposed roadway profile, cross sections and trunkline storm sewer system. The parameters for area, impervious percent, slope and width were recalculated for the updated drainage areas using the methods in Table 3**.** The proposed drainage areas can be seen in Figure 4.

3.2.2.2 Hydraulics

3.2.2.2.1 *Hydraulic Parameters*

The hydraulic parameters used in the base model were used as a baseline for this study and were verified and modified when necessary. Table 5 summarizes the hydraulic parameters used during this study. For all parameters not included in Table 5 the XP-SWMM default values were used. The hydraulic parameters used in each link in Study Area are provided in Appendix B, Table B4 and B5. The existing conditions Manning's n and entrance and exit loss coefficients were kept constant with the base model. The junction flood storage parameter was changed based on conversations with the City of Minneapolis as seen in Table 5.

Table 5
Hydraulic Parameters

Input Parameter	Value used in this Study	Value used in base model	Notes
Manning's n (RCP)	0.014	0.014	Recommended value, 0.012 – 0.014, Conservative estimate used for old RCP
Entrance Loss Coefficient	0.5	0.5	Recommended value, 0.1-0.5
Exit Loss Coefficient	0.5 used for manhole linkages and 1.0 used for outfalls	0.5 used for manhole linkages and 1.0 used for outfalls	Recommended value, 0.5-0.1
Junction Flood Storage (Ponding Area)	$500e^{1.0PondedDepth}$	$5000e^{1.0PondedDepth}$	Value changed in XP-SWMM model to better represent storage in an urban drainage system

Source: Recommended Values, City of Minneapolis XP-SWMM Hydrology and Hydraulics Guidance Manual (SRF, 2005)

3.2.2.2.2 *Stormwater Conveyance*

The XP-SWMM model used in this study incorporates integrated storm sewer and overland flow. The base model had modeled the trunk storm sewer lines and streets within the tunnel watershed. Outside the Study Area, the stormwater conveyance features were assumed to have no change from the base model. However, within the Corridor the stormwater conveyance systems were reviewed in detail by SEH and updated accordingly.

Five segments of trunkline storm sewer (diameter less than 24-inches) were added to the model to increase the level of detail. The storm sewer system attributes used in the model within the Corridor were taken from a combination of four sources and were assumed to have

the following hierarchy of accuracy: MnDOT HydInfra data, the City of Minneapolis GIS database, existing as-builts and GIS contours.

The surface water conveyance was modeled using a natural channel within a multi-link conduit. The same method for modeling street flow used in the base model was adopted within the Existing Conditions model. The overland flow channel depicting the roadway section was modeled as a standard cross section comprised of a 4-foot bottom width and 50H:1V side slopes to mimic a typical street section. This section was adequate for providing conveyance and storage across the entire Study Area. The top of casting elevation used in the existing XP-SWMM™ model was verified using four data sources including GIS contours, existing as-builts, HydInfra data from MnDOT, and the City of Minneapolis. All of the sources were compared and the most consistent value between the four elevations was used.

3.2.2.2.3 *Surface Storage*

The XP-SWMM model used in this study simulates surface storage using a combination of natural channels (streets), storage nodes and a default ponding equation (See Table 5). The base model included storage nodes throughout the tunnel watershed at points of localized ponding.

Because the existing conditions model updated by SEH was updated with the NOAA Atlas 14, Volume 8 rainfall depths, runoff volumes and high water levels increased from the base model throughout the Corridor. This increased the number of localized ponding areas. To analyze the system for an additional ponding areas created by this increase, the model was run with all nodes in the “sealed condition”. Nodes with over 4 feet of flooding in this “sealed” condition were updated as storage nodes. The linear area-elevation relationships used within the updated storage nodes were calculated from ArcGIS using 2 foot-contour data.

3.2.2.3 Calibration

The model developed during 2006 I-35W and St. Mary’s Storm Tunnel Study was calibrated based the Standards Study results. The Standards Study determined the directly connected impervious area (DCIA) of various land uses throughout the tunnelshed. The parameters developed as part of the Standards Study were then incorporated into the existing conditions model. In addition the model was compared against measured discharge data to the I-35W Tunnel at 27th street. Based on the comparison, the predicted discharges were slightly less than the measured discharges but were within acceptable tolerances. This was the basic methodology for calibrating the model previously during the I-35W and St. Mary’s Storm Tunnel Study.

The calibrated model developed for the 2006 I-35W and St. Mary’s Storm Tunnel Study has continually been updated by the City based on improvements made within the tunnelshed. SEH has also updated the existing conditions model based on recent improvements within the system. The model also has been updated to use the most accurate rainfall data available (Atlas 14). Therefore the existing conditions model used for this Study can be considered a calibrated model to predict runoff, peak discharge rates, HWLs and flooding depths utilizing the latest statistical rainfall data, Atlas 14.

3.3 Best Management Practices Selection

The project goals of volume reduction, water quality, and runoff rate control will be met using Best Management Practices (BMPs). Multiple types of BMPs will be used throughout the project to meet the different goals and site constraints. BMPs were investigated considering a number of factors including pollutant removal efficiency, constructability, project feasibility, cost, and maintenance.

3.3.1 BMP Review

To start the preliminary design process, a master list of BMPs was created to provide a comprehensive list of stormwater treatment options. The BMP Master List included more than 40 BMPs including infiltration practices, stormwater ponds, filtration practices, and smaller BMPs. The listing summarizes what design standard each would achieve, pollution removal, pros and cons, maintenance and site details, and project feasibility. The BMP Master List is located in Appendix B, Table B14. A further detailed analysis was carried out on the following BMPs:

- Stormwater ponds
- Filtration basins
- Structural Pollution Control Devices (SPCDs)

3.3.1.1 BMP Location Criteria

The location of any BMP intended to provide credit towards meeting water quality criteria were initially selected based on the following four criteria, listed in the order of preference:

1. Project Limits – This is defined as future public ROW limits within the Corridor (City, County, MnDOT). BMPs will be located within ROW to eliminate the need for right-of-way acquisition. All areas including green space, roadway, etc., were evaluated to construct BMPs.
2. Green Space areas within the Tunnelshed – Any open areas greater than 0.25 acre were considered as a potential location.
3. Identified Flooding Areas within the City – Based on the 1997 City of Minneapolis Report, all Problem Flood Areas (Located on Figure 8 of the I-35W and St. Mary's Storm Tunnel Study) were evaluated to determine if they are potential sites for a pond.
4. Areas outside of the Tunnelshed – These areas would fall under the alternative sequencing identified by the MWMO and the NPDES Permit.

3.3.1.2 Preliminary BMP Investigations

3.3.1.2.1 *HydroCAD® Modeling*

In initial BMP feasibility investigations, HydroCAD® was used to model treatment volume needed to meet the MWMO goal of treatment over the entire Study Area. The approximate volume aided in the selection of potential BMPs. A preliminary stormwater treatment volume and sample basins are located in Appendix B, Table B15.

3.3.1.2.2 *Preliminary Infiltration Investigation*

The initial investigation of underground infiltration or filtration devices raised concern regarding the feasibility of placing these structures under or along roadways. Maintenance of underground devices, getting cleaning equipment to the site, and safe access were also concerns since the access points would be along the high-traffic roadway.

During the design process, MnDOT developed a Technical Memorandum detailing locations where infiltration practices can be located adjacent to roadway pavement sections. This Technical Memorandum is called "Guidelines for Storm-Water Infiltration Location with Regard to Pavement Sections" and is located in Appendix C.

Based on this Technical Memorandum, it was determined that infiltration along the Corridor was not allowable because the potential sites violated the guidelines identified in the Technical Memorandum.

3.4 Water Quality Analysis

Compliance with the Study Area stormwater requirements was broken down into a three step process.

1. The overall treatment goal (per MWMO goals) was calculated for the Study Area.
2. The treatment provided to meet the NPDES Permit requirements was calculated and subtracted from the total goal.
3. The remaining MWMO treatment volume was determined and BMPs were designed to meet this remaining volume.

The water quality analysis is independent from the rate control portion of the study, conducted using XP-SWMM.

3.4.1 Modeling Software

3.4.1.1 Sizing Hydrodynamic Separators and Manholes

SHSAM® (Sizing Hydrodynamic Separators and Manholes) is a computer program produced by Barr Engineering Company (Barr) that predicts the amount of suspended sediments removed from stormwater runoff using a specified hydrodynamic separator. SHSAM® uses a continuous runoff model and generic sediment removal to measure sediment removal. SHSAM® was used to quantify the potential TSS removal by multiple types of SPCDs throughout the Corridor.

3.4.1.2 P8

The Program for Predicting Polluting Particle Passage thru Pits, Puddles, & Ponds (P8) is a model for predicting the generation and transport of stormwater runoff pollutants in urban watersheds (William W. Walker, 2014). The program uses a continuous water-balance and mass-balance to calculate pollutant dynamics in watersheds and stormwater treatment features. P8, Version 3.4 was used to estimate the pollutant removal, specifically for TSS and Total Phosphorus (TP), in the proposed stormwater features.

3.4.2 Basin Sizing

Proposed basin volumes were maximized to meet both the rate control and water quality standards. The basins were located using the criteria in Section 3.3.1.1. In addition to the criteria in Section 3.3.1.1, the locations were also chosen based on existing and proposed noise wall locations. Figure 15 in Appendix A shows existing and proposed noise wall locations in the 94 Commons area. The proposed basins were graded into the proposed roadway section using GeoPak SITE. This methodology uses a dynamic model that takes the proposed roadway elevation and cross section into account. The basin stage storage relationships were calculated using HydroCAD® stormwater modeling software. The basin water quality volume was set according to the assumed infiltration rate, which dictates the basin depth.

3.4.3 SPCD Selection

To keep continuity between the Crosstown Project and the I-35W Corridor Drainage study, SPCDs were modeled as a potential water quality treatment device. The Crosstown Project used Downstream Defenders® for SPCDs, analyzing their efficiency with SHSAM®. SAFL Baffles® were modeled in the Study Area per requests from MnDOT. Stormceptors® were also modeled because after a sensitivity analysis, Stormceptors® showed the highest TSS removal rate among a selection of SPCDs. The sensitivity analysis of removal amounts between the Stormceptor® and SAFL Baffle® is located in Table B8 in Appendix B.

3.4.4 SPCD Design

In addition to the infiltration location criteria in Section 3.3.1.1, SPCDs were placed based on trunk sewer line locations, ease of access and safety for maintenance personnel, and proposed roadway.

Each SAFL Baffle® and Stormceptor® was modeled using the following inputs:

- Contributing Drainage Area: Measured in ArcGIS (including areas outside the project ROW that contribute stormwater to storm sewer system), using drainage areas from the City of Minneapolis. The drainage areas used were adjusted based on the proposed roadway geometry and the proposed filtration basins.
- Proposed Impervious Percentage: Calculated as described in Section 3.4.6.
- Particle Distribution: Same distribution as used in the Crosstown Project and P8 analysis and described in Section 3.4.5.
- Storm Event: The MWMO requirement of a synthetic SCS Type II, 24-hour storm distribution (1.17 inches over 24 hours).
- Temperature: Daily St. Paul temperature file, provided in the SHSAM® model.
- Hydraulic Length: Measured as the longest path water travels to reach the storm sewer, measured in ArcGIS. The hydraulic length was verified in HydroCAD® as described in Section 3.4.7.
- Slope: Average roadway slope of each drainage area was calculated with information obtained from GIS and Minneapolis LiDAR data.
- Curve Number: An average curve number representing the pervious surfaces was selected for all model runs. A curve number of 69 was selected to represent the pervious surfaces and to mirror P8 inputs.
- Influent Concentration of Suspended Sediment: 200 mg/l. Number obtained from MnDOT and was used in the Crosstown SPCD analysis.

3.4.5 Particle Distribution

The particle distribution used for the project was based on a distribution developed for the Crosstown Project. This distribution represents a typical particle distribution that would be present within an urban roadway corridor. MnDOT directed the use of this distribution for its accuracy relative to the Corridor conditions and for consistency to the Crosstown Project.

A sensitivity analysis was performed comparing the particle distribution used in the Crosstown Project and a standard particle distribution in SHSAM®, the Nationwide Urban Runoff Program (NURP) 1986 particle distribution. The Crosstown Project particle distribution is more similar to a road sand particle curve, more representative of a roadway corridor. The Particle Curve Sensitivity Analysis between the Crosstown Project particle distribution and NURP particle distribution can be found in Table B9 in Appendix B.

3.4.6 Impervious Area Calculations

The impervious percentages of drainage areas were calculated in the following manner:

- The proposed impervious roadway section was overlaid on the adjusted Minneapolis drainage basins and proposed impervious acres were calculated per drainage basin. The existing impervious acreage of the adjusted Minneapolis drainage basins, obtained from the XP-SWMM model, was compared to the proposed impervious area. The difference between existing and proposed was calculated and a new, proposed impervious acreage per drainage area was calculated using the proposed impervious areas plus or minus the difference. See Table B10 in Appendix B for adjusted drainage area impervious percentages.
- The total impervious acres over total drainage area percentage was taken for the SPCD subwatersheds that encompassed more than one drainage area.

3.4.7 Hydraulic Length Verification

Hydraulic length for each drainage basin was input into HydroCAD® to verify that the length measured resulted in a time of concentration greater than the required minimum of seven minutes, per the MnDOT Drainage Manual (Minnesota Department of Transportation, 2014). For drainage areas where the measured hydraulic length did not result in a time of concentration greater than seven minutes, the hydraulic length in HydroCAD® was adjusted to satisfy the requirement. In those cases, the HydroCAD® adjusted hydraulic length was used in SPCD modeling.

Inputs to the HydroCAD® model included:

- Pervious and Impervious Area: Measured from ArcGIS for each drainage area.
- Pervious and Impervious Curve Number: An average pervious CN of 69 and impervious CN of 98 was used in the model.
- Slope: Slope was measured for the hydraulic length.
- Hydraulic Length: Initially measured in ArcGIS, and adjusted if necessary.

4.0 Existing Conditions

4.1 Site Characteristics

The existing conditions model incorporates the hydrology and hydraulics characteristics of the I-35W tunnelshed. Totaling 4.9 square miles in area (broken into 654 individual drainage areas), the watershed is an urban drainage system with mixed land use characteristics and complex stormwater conveyance systems. The I-35W Tunnel is located centrally in the watershed, and is the ultimate receiving point of the watershed's localized storm sewer systems. The localized storm sewer systems that are routed to the tunnel pick up overland runoff from the residential and commercial areas within the City of Minneapolis.

The 12-foot diameter tunnel runs from south to north under the I-35W Corridor from 39th Street to the intersection of I-35W and I-94. This intersection is the junction of the I-35W Tunnel and a second 9-foot diameter tunnel running from west to east along the I-94 corridor. Downstream of this intersection, the I-35W, 13-foot tunnel runs northeast until it reaches its ultimate receiving point and system outfall, the Mississippi River.

There are a total of 15 localized storm sewer systems from the City of Minneapolis that run into the I-35W tunnel. These Minneapolis storm sewer systems connect into the tunnel at trunk storm sewer lines within the Corridor or at of the six dropshaft locations within the Study Area. Storm sewer lines were included within the model if they were greater than 24-inches in diameter. See Figure X for a map of the pipe nodes and links included within the Existing Conditions Model.

Land use types within this large urban watershed are highly variable and range from residential to industrial. *The I-35W and St. Mary's Storm Tunnel Study* identified 19 different land use types within the watershed using aerial photos and employed them to determine impervious percentage for hydrologic modeling (SRF Consulting Group Inc., 2006). Of primary importance to this study is the area within the I-35W Corridor ROW. This area is primarily impervious, with small pervious areas located along the edges of the ROW and within interchange areas. The total existing impervious percentage within the disturbed Study Area is shown in Table 6.

Table 6
Existing Corridor Impervious

Project Segment	ROW (ac)	Existing Impervious Area (ac)	Existing Impervious (%)
94 Commons	57.5	26.1	45.4
Transit Access	41.2	27.5	66.8
Gap	42.1	22.1	52.5
Total	**140.8**	**75.7**	**53.8%**

4.2 Critical Locations

This Study Area contains approximately 2.8 miles of the existing I-35W Corridor spanning from 42nd Street to the I-94 Interchange. The majority of the existing I-35W Corridor within the project is lower in elevation than the surrounding streets, causing high potential for flooding. Eleven (11) bridges cross over I-35W connecting City streets. The existing corridor within the Study Area contains high points at Lake Street, between 35th and 36th Street and at 19th Street. At 31st Street, Lake Street and the Midtown Greenway, the roadway corridor transitions to a bridge section that spans over the City streets below. The five existing low points in the Corridor are approximately located at the following intersections (See Figure 2 in Appendix B for Existing Site Characteristics):

- I-35W and 42nd Street

- I-35W and 35th Street
- I-35W and 27th Street
- I-35W and Franklin Street
- I-35W "Braid" bridge

In addition to the 5 sag points located within the proposed construction limits of the three project segments, there is also a major sag point located at 46th St. This location is considered a critical location even though it is not located within the project limits.

The I-35W and St. Mary's Storm Tunnel Study identified a set of critical points in the study that had flooding depths of two or more feet. The critical locations identified in that study and located in this Study Area can be found in Appendix A, Figure 35. Three of those critical points identified by the I-35W and St. Mary's Tunnel Study are also critical node locations in this study. The points on Figure 35 are considered 'true sag' points according to the MnDOT Drainage Manual because they have the potential to flood greater than 2 feet in depth or greater without an outlet.

4.3 Historic Flooding Issues

Previous investigations of the tunnelshed have identified specific areas of concern that should be noted in this study as documented in the *I-35W and St. Mary's Storm Tunnel Study*. Existing flooding issues that have been deemed significant are as follows:

- Of significant concern are the 42nd Street low point and 46th Street low point within the I-35W Corridor. These low points discharge through existing storm trunk line to the 39th Street dropshaft. These areas have seen flooding as recent as the summer of 2004 (SRF Consulting Group Inc., 2006).
- Geysering has historically occurred at the 35th and 39th Streets dropshafts. Geysers have been observed that project water to nearly 30 feet in the air (SRF Consulting Group Inc., 2006). The geysering is thought to be an effect of air entrainment in the tunnel due to the stormwater falling in the dropshafts, creating pressurization and capacity issues. Surge chambers were installed at these locations in 2008 to alleviate the geysering problem. However, pressurization and capacity issues still exist within the tunnel system.

4.4 Existing Water Quality

Currently, there are no water quality treatment devices within the Corridor. Stormwater enters the storm sewer system, the Tunnel, and eventually discharges into the Mississippi River with no treatment.

SHSAM® was used to model the existing conditions TSS loading over the project ROW. Using the inputs listed in Section 3.4.4 and an existing impervious percentage of 53.8%, the TSS load for the Corridor with existing conditions is 4,288 pounds.

4.5 Existing Conditions Model Development

Table 7 describes the models that were compared throughout this process. The existing conditions XP-SWMM model updated by SEH was set by making the updates summarized in Section 3.2.2. Several iterations were modeled to analyze the baseline condition for the existing conditions model. The purpose of these iterations was to isolate the impacts to the model caused by the updated version of XP-SWMM, the updated rainfall from NOAA Atlas 14, Volume 8, and the updates made in the model development process. The results of these model runs are summarized in Table 8. Complete results for the 2014 Existing Conditions Atlas 14 model run are included in Tables B6 and B7 in Appendix B.

During the existing conditions model update, the model was updated to improve the continuity (i.e. stability). Overall the model was improved to provide a more stable system that improved the continuity of the model within XP-SWMM. A modeling log was developed identifying all of the changes made to improve overall performance of the model, reduce the continuity error and improve stability. The modeling log is included within Appendix H.

Table 7
Existing Conditions Model Progression

Model Name	Year	XP-SWMM Version	Rainfall Depth Distribution	Notes
Tunnel Study Model	2006	Ver. 10.5	TP 40	The results in Table 8 representing this model run were taken directly from the 2006 tunnel study results.
2006 Tunnel Study (TP 40)	2006	2012	TP 40	2006 Model analyzed using XP-SWMM 2012
2006 Tunnel Study (Atlas 14)	2006	2012	NOAA Atlas 14, Volume 8	2006 Model ran using Atlas 14 depths
Minneapolis (TP 40)	2013	2012	TP 40	Updated Model obtained from the City. Referred to as 'base model' in this study.
Minneapolis (Atlas 14)	2013	2012	NOAA Atlas 14, Volume 8	Model re-run using Atlas 14 depths
2014 Existing Conditions (Atlas 14)	2014	2012	NOAA Atlas 14, Volume 8	Finalized Existing Conditions Model

4.5.1 Results

Table 8 summarizes the 100-year high water level results for critical areas along the Corridor (as detailed in Section 4.2) for each of the models that were compared in this Study. The full existing conditions results summary is located in Table B6 in Appendix B. The XPSWMM Routing diagram is located in Figure 11. The purpose of this analysis was to develop a new baseline condition for this Study. The past studies including the 2006 Tunnel Study and the Minneapolis Model were carried out using outdated rainfall depths and distributions as well as outdated XPSWMM modeling software.

The Existing Conditions model will re-establish the baseline high water levels In the I-35W Corridor, based on updated rainfall and infrastructure information. The high water levels increased in the Existing Conditions model from the Minneapolis TP 40 model run as expected, because of the new Atlas 14 rainfall information. Additionally the inclusion of the junction flood storage function decreased the continuity error in the model and stopped the model from losing runoff volume. This ponding function as well as the addition of more detail in the corridor storm sewer contributed to the increases in high water levels between the Minneapolis model and the Existing Conditions model.

It should be noted that the depth of flooding found within the updated model is greater than 10 feet at the 42nd Street low point. Further consideration should be given to an improvement project to mitigate the potential for this depth of flooding along I-35W. Improvements identified in past projects include a new tunnel or deep caverns for underground storage. Reducing the flooding depth at the 42nd Street location is beyond the scope of this study.

Table 8
Comparison of 100-yr High Water Levels

Location	Critical Node Locations		2006 Tunnel Study						Minneapolis				2014 Existing Conditions	
	Name	Top of Casting [5]	TP 40[1] (Previous XP-SWMM)		TP 40[1] (XP-SWMM 2012)		NOAA Atlas 14 (XP-SWMM 2012)		TP 40[1]		NOAA Atlas 14[2]		NOAA Atlas 14[2]	
			Peak HWL (ft)	Δ El [3,4]	Peak HWL (ft)	Δ El [3,4]	Peak HWL (ft)	Δ El [3,4]	Peak HWL (ft)	Δ El [3,4]	Peak HWL (ft)	Δ El [3,4]	Peak HWL (ft)	Δ El[3,4]
I94/35W at Portland Ave	DS16	810.9	814.6	3.7	814.9	4.0	819.9	9.0	817.9	7.0	821.7	10.8	820.6	9.7
35th and 35W-Drop Shaft	DS2 (35th)	840.1	838.6	-1.5	838.8	-1.3	839.3	-0.8	838.0	-2.1	839.2	-0.9	840.6	0.5
39th and 35W-Drop Shaft	DS1 (39th)	838.1	837.8	0.3	838.1	0.0	838.2	0.1	837.8	0.3	838.2	0.1	838.6	0.5
42nd St and 35W- Low Point	42nd	821.7	827.3	5.6	827.4	5.7	829.0	7.3	826.0	4.3	826.4	4.7	832.9	11.2
46th St and 35W- Low Point	B5565	829.3	831.9	1.7	832.0	2.7	832.6	3.3	828.9	-0.4	828.3	-1.0	833.1	3.8

[1]TP 40 Rainfall SCS Type II, Depth=5.9"
[2] NOAA Atlas 14 Rainfall Depth (7.5"), Nested Distribution
[3]Positive number represents flooding
[4]Represents el. difference between node top of casting and peak water el.
[5]Verified with City of Minneapolis As-Builts

4.6 Existing Conditions Discharge Rates

Table 9 represents the Existing Conditions model discharge rates, calculated using Atlas 14 rainfall depths and a nested distribution. The existing hydrologic runoff hydrographs were developed using XP-SWMM with the hydrologic parameters described in Section 3.1.2. Figure 11 included in Appendix A depicts the XP-SWMM basin model schematic for the I-35W Transit Access Project with the locations of links and nodes. Table 9 summarizes the peak runoff rates at each of the dropshafts within the Study Area. These existing peak rates are used as the baseline comparison throughout the design process. A composite hydrograph for each of the dropshafts was used to determine the peak discharge rates. A complete summary of the results and associated hydrographs for the hydrologic analysis is included in Appendix B.

4.6.1 Results

Table 9
Existing Conditions Discharge Rates Results

Type	XP-SWMM Node Name	Location	Existing Conditions Model Peak Outflow Rate (cfs)[1]		
			2-year	10-year	100-year
Dropshaft	DS1 (39th)	I-35W and 39th Street	791	957	1389
Dropshaft	DS2(35th)	I-35W and 35th Street	392	599	1011
Dropshaft	DS3(31st)	I-35W and 31st Street	225	340	618
Dropshaft	DS4(27th)	I-35W and 27th Street (Wells Fargo Site)	619	783	887
Dropshaft	DS15	I-94 and I-35W Interchange	25	44	49
Dropshaft	DS16	I-35W and Portland Ave	88	130	151
Summation of Dropshaft Peaks			2139	2853	4105

[1]Model: 2014 Existing Conditions (Atlas 14)

5.0 Proposed Conditions

5.1 Design Considerations

5.1.1 Project Wide

The proposed drainage features were designed to allow for access during inspection and maintenance activities.

The filtration basins were placed adjacent to the roadway, with an access road located parallel to the basins and the roadway. The access roads were designed to allow maintenance and inspection personnel to safely travel along the basins without impacting mainline traffic during operations.

The overall Study Area and surrounding areas were reviewed for placement of SPCDs. During the initial scoping of SPCD locations, areas within and outside of the project limits were identified.

5.1.2 94 Commons

The 94 Commons project segment consists of the I-94 and I-35W Interchange and south on I-35W to approximately East 26th Street. This project is proposing to change the layout of the Corridor significantly in this section. The I-35W “braid” bridge and the I-35W “flyover” bridge connecting I-35W northbound to I-94 westbound will be removed and reconstructed.

One of the major design considerations in this area is the proposed lowering of I-35W north of 26th Street to Franklin Avenue. The Corridor is being lowered 10-16 feet in this area, and by lowering the roadway within this area, the existing trunk storm sewer system will be impacted. See Figures 29 and 30 in Appendix A for the proposed roadway profile of the 94 Commons project segment. The existing storm sewer system in the lowered roadway area was analyzed for cover and determined that portions of the trunk storm sewer line will need to be reconstructed based on minimum cover requirements.

5.1.3 Transit/Access

The Transit/Access project segment is located on I-35W from the termination of the 94 Commons project segment at approximately East 26th Street to East 32rd Street.

This area is being reconstructed with the addition of a Bus Rapid Transit (BRT) station near Lake Street, and a high quality pedestrian/bicycle connection between the Midtown Greenway and Lake Street. The new transit access station is increasing the impervious surface by expanding the width of the I-35W corridor in this area. .

5.1.4 Gap

The Gap project segment extends from the termination of the Transit/Access project segment at East 32rd Street to East 42nd Street on I-35W.

Although there are no roadway profile changes being proposed within this section of roadway, MnDOT is planning to do a partial depth pavement replacement and shoulder expansions along this segment of roadway (see Figure 21). The partial depth pavement replacement will remove the upper layers of pavement to accommodate a new concrete roadway section without disturbing the underlying, in situ soils. The partial depth pavement replacement does not trigger the stormwater management requirements of the MWMO. This was confirmed with the MWMO and they noted it is considered a mill and overlay based on their rules. The email documenting the record of conversation is included in Appendix D. However the shoulder widening through the Gap segment will trigger the stormwater management requirement and the impervious surface area will need to be treated.

There are two major roadway sag point located within the Gap segment, located at approximately 35th Street and 42nd Street. These low points have a history of flooding, and are critical areas in analyzing the Project's high water level impacts.

5.2 Project Impacts

The addition of impervious surface to the Study Area results in increased runoff and pollutant loading into the system. Flooding in the system is also affected due to loss of green space for infiltration and the change in the roadway profile. The changes in impervious areas are summarized in Table 10.

The new impervious area in Table 10 was calculated from the roadway design dated May 23, 2014 (includes Gap segment updates).

Table 10
Project Impervious Impacts

Segment	Existing Area (ac)	Proposed Area (ac)	New Area (ac)
94 Commons	26.1	25.6	-0.5
Transit Access	27.5	35.9	+8.4
Gap	22.1	23.3	+1.2
Total	75.7	84.8	9.1

5.2.1 Water Quality

SHSAM® was used to model proposed conditions with the inputs described above. Table 11 summarizes the change in TSS loading from existing to proposed impervious conditions for the project corridor. The impervious area in the project corridor increased from 75.7 to 84.8 acres and resulted in an increased loading of 482 pounds of TSS over the design event.

Table 11
Project Wide TSS Loading

Existing (lbs)	Proposed (lbs)	Change (lbs)
4,288	4,770	+482

Tables 12 and 13 summarize the water quality goals per the MWMO and NPDES permit. The MWMO requires that 90% of TSS over the Study Area be removed, resulting in a removal goal of 4,293 pounds.

Table 12
MWMO Goal

Proposed Project Loading (lbs of TSS)	90% Removal (lbs of TSS)
4,770	4,293

The NPDES permit requires that a water quality volume of 1 inch of rainfall over the new impervious area is provided.

Table 13
NPDES Water Quality Volume Standard

Segment	Net New Impervious (ac)	Water Quality Volume (1" over new impervious) (cf)
94 Commons	-0.5	0
Transit Access	8.4	30,492
Gap	1.2	4,356
Total	9.1	34,900

5.2.2 Rate Control

The project's increased impervious surface area and profile changes impact the peak discharge rates within the Study Area. The design requirement for rate control per Section 2.3.1.2 above states that peak discharge rates for the Study Area may not exceed pre-development runoff rates for the 2-, 10-, and 100-year critical storm events. The peak discharge rates for the system were evaluated on a project wide basis. The overall system discharge rate is considered the sum of the peak discharge rate into each of the dropshafts within the Study Area. See Tables 21, 22, 23 and 24 for the peak discharge rate analysis results.

5.2.2.1 94 Commons

The 94 commons segment of the project contains two of the dropshafts within the Study Area, DS16 and DS15. DS15 is located upstream of the tunnel junctions and DS16 is located at the junction of the I-94 and I-35W tunnel. Although the 94 Commons segment has no increase in impervious acres, it is located at the downstream end of the system and is affected by impervious impacts further upstream.

5.2.2.2 Transit/Access

The Transit/Access segment contains two dropshafts within the Study Area, DS3 (31st) and DS4 (27th). DS3 is located at 31st Street below the I-35W/31st Street Bridge and DS4 is located at 27th Street and I-35W near the Wells Fargo Campus. Transit/Access segment of the project sees the highest increase in impervious of the three project segments. The runoff rates increase in this area due to the increased impervious surface area.

5.2.2.3 Gap

The Gap segment contains two dropshafts within the Study Area, DS1 (39th) and DS2 (35th). DS1 is located at 39th Street and the I-35W Corridor, and DS2 is located at 35th Street and the I-35W Corridor. Both DS1 and DS2 contain surge chambers that were constructed in 2006 to alleviate geysering at the surface but do not relieve the pressurization within the tunnel itself. While there are no profile changes in the Gap segment, there are increases in rates due to the increased impervious surface area.

5.2.3 High Water Levels

The high water levels throughout the project are impacted by the proposed roadway profile changes as well as the additional impervious surface area. Overall the project is being designed to maintain existing conditions high water levels and not cause an adverse condition to the overall drainage system. This Study is not intended to fix the known capacity issues of the Tunnel or the existing highway and local flooding. As described in Section 2.3.1.3, the project design criteria states that during the 100-year storm, areas flooding during existing conditions shall see no increase in flooding depths and 0.5 feet of freeboard from the

top of casting will be maintained during the 50 year storm for all structures that do not flood (HWL exceeds the top of casting) under existing conditions.

5.2.3.1 94 Commons

Dropshaft DS16 within the 94 Commons portion of the project is a critical Corridor sag point and has a history of flooding. Additionally the high water levels were impacted by the lowering of the roadway between 26th Street and Franklin Avenue at I-35W South (See Table 25). The cover over the storm sewer system trunkline is reduced with this profile change, allowing for less bounce within the manhole.

5.2.3.2 Transit/Access

Dropshafts DS4 (27th) and DS3 (31st) within the Transit Access portion of the project do not have a history of flooding. The addition of the Transit Access station in this portion of the project requires widening of the Corridor. This has impacts on the cover of pipe systems draining into the Corridor from offsite.

5.2.3.3 Gap

The Gap segment contains the 35th Street low point, 42nd Street low point and 46th Street low point. These are areas with a history of flooding within the project. This area was not impacted greatly by the roadway impacts, as there were no profile changes in this segment, and the impervious change of 1.2 acres was not significant enough to cause additional flooding.

5.3 Recommended Stormwater Features

5.3.1 Project Wide

The recommended stormwater features were designed to mitigate the project's impact on pollutant loading, rate control and high water levels and meet the project design criteria described in Section 2.2. The recommended features include two filtration basins and a series of SPCDs placed throughout the entire Study Area, described below.

The two filtration basins were designed in the project corridor to help meet both water quality and rate control requirements. The 24th Street Basin is located on the west side of I-35W, between East 22nd Street and East 24th Street. The 33rd Street North and 33rd Street South basins are located on the west side of I-35W, between East 32nd Street and East 34th Street. Stormwater from the 33rd Street North Basin is piped to the 33rd Street South Basin. Both basins were designed to maximize the footprints between the project ROW and the proposed roadway profile. Basin characteristics are summarized in Tables 14, 15 and 16.

Table 14
Stage Storage 24th Street Basin

Depth (ft)	Elevation (ft)	Area (ac)	Cumulative Storage (cu-ft)	Notes
-2.5	840.5	0.14	0	Bottom of Filtration Media[1]
0.0	843.0	0.17	4167	Top of Filtration Media
1.0	844.0	0.19	11994	
2.0	845.0	0.22	20890	
3.0	846.0	0.24	30874	
3.2	846.2	0.25	33002	Skimmer Elevation
4.0	847.0	0.27	41958	
5.0	848.0	0.29	54154	
6.0	849.0	0.35	88154	Top of Basin
[1] Filtration media considered 25 percent void space				

Table 15
Stage Storage 33rd Street North Basin

Depth (ft)	Elevation (ft)	Area (ac)	Cumulative Storage (cu-ft)	Notes
-2.5	855.5	0.10	0	Bottom of Filtration Media[1]
0.0	858.0	0.12	2947	Top of Filtration Media
1.0	859.0	0.14	8516	
2.0	860.0	0.16	14915	
3.0	861.0	0.18	22167	
3.2	861.2	0.18	23722	Skimmer Elevation
4.0	862.0	0.20	30299	
5.0	863.0	0.22	39335	
6.0	864.0	0.26	49806	Top of Basin
[1] Filtration media considered 25 percent void space				

Table 16
Stage Storage 33rd Street South Basin

Depth (ft)	Elevation (ft)	Area (ac)	Cumulative Storage (cu-ft)	Notes
	852.5	0.03	0	Bottom of Filtration Media[1]
0.0	855.0	0.04	945	Top of Filtration Media
1.0	856.0	0.05	2900	
2.0	857.0	0.06	5168	
3.0	858.0	0.06	7767	
3.2	858.2	0.07	8336	Skimmer Elevation
4.0	859.0	0.08	10934	
5.0	860.0	0.09	14667	Top of Basin
[1] Filtration media considered 25 percent void space				

Twenty-one potential locations of SPCD's were identified and analyzed to determine their removal efficiencies based on the contributing drainage area. The total treatment provided by the twenty-one locations exceeds the water quality requirements of the project. Therefore the twenty-one locations were reviewed to determine the most feasible and practical locations needed to meet the project goals. The filtration basins were determined to remove 1,185 pounds of TSS (See Table B11). Therefore the SPCD's need to remove 3,108 pounds of TSS to meet the remaining goal of the project, as specified in Table 12. Table 17 summarizes what devices (SAFL Baffles®) are recommended to keep to meet the water quality goals.

Table 17
SAFL Baffle® Placement

Segment	Recommended SPCDs	Total Removal (lbs)
94 Commons	17, 18, 19, 20, 21	852
Transit/Access	6, 7, 12, 13, 15, 16	1820
Gap	1, 2, 3	608
Total	14 SPCDs	3280

The recommended SPCDs are all located within the project limits. The SPCDs not selected to meet the water quality goals include SPCDs located within and outside of the project limits (4, 5, 8, 9, 10, 11, and 14). These SPCDs do not need to be installed to meet the project TSS removal requirement.

All SPCD modeling was done assuming a clean, well maintained SPCD in the drainage area.

Should Stormceptors® be the chosen SPCD, the recommended number of SPCD's can be reduced because they removed more pounds of TSS in the design storm than SAFL Baffles®. If Stormceptors® are selected for the final design, the sum of pounds removed of the chosen locations must total as least 3,108 pounds of TSS to meet the design goals.

5.4 Proposed Conditions Results

5.4.1 Water Quality

Filtration basins are proposed to meet the requirements of the MPCA Construction Stormwater Permit. Soils investigation work was completed within the vicinity of the 33rd St. Basin (see Appendix G). The soils were found to be predominantly sand however there was a lens of lean clay found approximately at the basin bottom. MnDOT has developed a technical memorandum (TM No. 14-06-ENV-01) outlining allowable infiltration locations along MnDOT roadways. The stormwater treatment areas were selected to be filtration basins as a conservative estimate based on the varying soils information obtained. If soil conditions deemed acceptable for infiltration after further analysis and the basin is located outside of the exclusionary zone as outlined in the technical memorandum, the basins could be redesigned to be infiltration basins by either removing the draintile or installing a gate valve on the draintile to control the discharge of stormwater through the draintile. The filtration basins serve as the primary treatment method to meet the MPCA stormwater requirements.

Table 18
Proposed Basin Water Quality Volume

Basin	Water Quality Volume (cu-ft)	NPDES Goal (cu-ft)
24th Street	33,002	**34,900**
33rd Street North and South	32,058	
Total	**65,060**	

To meet the NPDES water quality volume goal of retaining the first inch of stormwater runoff over net new impervious (See Table 13), the basins must have 34,900 cubic feet of storage. The water quality volume provided in the basins exceeds the NPDES water quality volume required to meet the requirement (see Table 18). The basins alone meet the NPDES requirement. The basins also remove TSS, helping to meet the MWMO goal. The TSS removal rates were modeled in P8 and the two basins were determined to remove 25% of TSS produced during the design storm event, removing a total of 1,185 pounds of TSS (See Table B11 in Appendix B). Pretreating the stormwater prior to discharging into the filtration basins is recommended. A SPCD is recommended to be located upstream of each discharge pipe into the basin. These SPCD's were included within the filtration basin as a combination SPCD pretreatment and filtration basin final treatment system. The remainder of the MWMO goal (a minimum of 65% of TSS produced during the design storm event) not met by the TSS removal of the filtration basins is met by TSS removal by the SPCDs.

Both SAFL Baffles® and Stormceptors® were modeled in the project corridor to quantify TSS removal. As described above, Stormceptors® were modeled because they showed the highest TSS removal rates and SAFL Baffles® were modeled as requested by MnDOT. Table B8 in Appendix B shows differences in removal amounts between the two SPCDs.

SAFL Baffles® were modeled as eight foot diameter structures because the SPCD specification for Downstream Defenders specified SPCDs with an inner diameter of at least eight feet. The standard SAFL Baffle® result is for a six foot deep structure. Each potential SAFL Baffle® manhole structure height will vary depending on existing storm sewer depth. SAFL Baffles® require at least three feet of sump below the outlet pipe. Depth estimates are located in Figures 22-28 in Appendix and are estimated based on best available information.

The SPCDs were placed throughout the corridor, maximizing treatment of the Corridor. Because of the storm sewer system layout and offsite areas contributing to the storm sewer systems located on I-35W, stormwater runoff from offsite areas were treated as a result of the system routing. This is expected given the complexity of the systems and the inability to separate I-35W stormwater runoff from adjacent areas. Maps of modeled locations per Study Area are shown in Figures 12, 13 and 14 in Appendix A. All existing storm sewer inverts, surface elevations, structure depths, and utility crossings must be verified before final design. More details about individual SAFL Baffle® designs are located in Figures 22, 23, 24, 25, 26, 27 and 28 in Appendix A.

Locations were chosen based on site topography and existing storm sewer. Most SPCDs were modeled at low points in the drainage area, to treat most of the water that enters the system through that drainage area. Storm sewer pipes will have to be installed between the trunk sewer line and the SPCD in order to locate SPCDs in safe areas for access and maintenance. Each location was modeled using nearby storm sewer diameter as the diameter of the pipe that diverts flow from the trunk sewer line to the SAFL Baffle® and back to the trunk line after treatment.

Table 19 provides a summary of project wide removal by all twenty-one SPCDs shown in Figures 12, 13 and 14 in Appendix A. Modeling all 21 locations, both types of SPCDs meet the NPDES removal goal. The Stormceptors® removed 16.4% more TSS during the design storm than SAFL Baffles®.

Table 19
Project Wide SPCD TSS Removals

	TSS Removal (lbs)
90% MWMO TSS Goal	4,293
SAFL Baffle®	4,822
Stormceptor®	5,683
SPCD Removal Percent Difference	16.4%

The combination of filtration basins and SPCDs remove enough TSS and have enough volume to meet water quality goals. A summary of the project wide water quality volume and pollutant removal goals is found in Table B11 in Appendix B.

5.4.1.1 94 Commons

Five SPCDs were modeled in the 94 Commons Study Area. See Figure 12 in Appendix A and Tables B12 and B13 in Appendix B for specific locations and removal amounts for both the SAFL® Baffle and Stormceptor®.

5.4.1.2 Transit/Access

Thirteen SPCDs were modeled in the Transit/Access Study Area. See Figure 13 in Appendix A and Tables B12 and B13 in Appendix B for specific locations and removal amounts for both the SAFL® Baffle and Stormceptor®.

5.4.1.3 Gap

Three SPCDs were modeled in the Gap Study Area. See Figure 14 in Appendix A and Tables B12 and B13 in Appendix B for specific locations and removal amounts for both the SAFL® Baffle and Stormceptor®.

5.4.2 Rate Control

5.4.2.1 Proposed Model development

The proposed conditions analysis consisted of three separate model scenarios. First, the existing conditions model was updated with the project's proposed profile elevation changes to create the Proposed Conditions Model. The proposed top of casting was evaluated using Bentley Geopak Version V8i to obtain an elevation from a proposed alignment and offset. To model the project wide impervious area, the existing and proposed impervious values were split up by drainage area to find a proposed change (delta) in impervious area. This value was added to the existing impervious area from XP-SWMM to obtain a proposed XP-SWMM impervious area. The impervious area was then divided by the total drainage area to obtain a drainage area specific proposed impervious percentage.

Table 20
Proposed Conditions Model Progression

Model Name	XP-SWMM Version	Rainfall Depth Distribution	Notes
Existing Conditions Model	2012	NOAA Atlas 14, Volume 8, Nested	Existing Conditions Model Updated by SEH
Proposed Conditions Model	2012	NOAA Atlas 14, Volume 8, Nested	Proposed Conditions model incorporating impervious area and profile changes
Proposed Conditions with Filtration Basins	2012	NOAA Atlas 14, Volume 8, Nested	Proposed Conditions model with the proposed filtration basins

The final model was an updated version of the proposed conditions model incorporating the filtration basins. This model includes the stage-storage relationship, outlet control structures, drainage area, and any replaced storm sewer required for the proposed rate control features. The outlet structures were evaluated to comply with freeboard requirements, while still obtaining the maximum rate control benefits. One foot of freeboard must be maintained from the shoulder edge or low point in the adjacent roadway to the 100-year high water level.

The proposed conditions with filtration basin model was analyzed for compliance with the rate control criteria. The two proposed filtration basins were modeled within XP-SWMM to determine the proposed conditions peak discharge rates.. A summary of the proposed conditions peak discharge rates can be seen in Tables 21, 22, 23 and 24. A complete summary of the link results is located in Table B7 – XP-SWMM Link Results within Appendix B. The combined three project segments meet the criteria for rate control. Overall, the peak discharge rates decreased from existing conditions to the proposed conditions with the filtration basins in place for the 2-, 10-, 50- and 100-year event. There is a slight decrease in the rates for the proposed conditions analysis because of changes in the drainage patterns due to profile changes. This proposed conditions analysis increases actually increases HWLs at the sag points.

Table 21
Proposed 2-Year Discharge Rates Results

Segment	XP-SWMM Node Name	Location	2-year Peak Discharge Rate (cfs)		
			2014 Existing Conditions[1]	Proposed Conditions[2]	Proposed Conditions with Basins
Gap	DS1 (39th)	I-35W and 39th Street	791	796	810
Gap	DS2(35th)	I-35W and 35th Street	392	398	387
Transit Access	DS3(31st)	I-35W and 31st Street	225	228	231
Transit Access	DS4(27th)	I-35W and 27th Street (Wells Fargo Site)	619	604	593
94 Commons	DS15	I-94 and I-35W Interchange	25	17	23
94 Commons	DS16	I-35W and Portland Ave	88	84	78
Summation			2139	2126	2121

[1]2014 Existing Conditions (Atlas 14)
[2] Rates are lower as a result of profile changes which cause changes in drainage areas and increases to HWLs

Table 22
Proposed 10-Year Discharge Rates Results

Segment	XP-SWMM Node Name	Location	10-year Peak Discharge Rate (cfs)		
			2014 Existing Conditions[1]	Proposed Conditions[2]	Proposed Conditions with Basins
Gap	DS1 (39th)	I-35W and 39th Street	957	946	937
Gap	DS2(35th)	I-35W and 35th Street	599	602	614
Transit Access	DS3(31st)	I-35W and 31st Street	340	346	346
Transit Access	DS4(27th)	I-35W and 27th Street (Wells Fargo Site)	783	770	744
94 Commons	DS15	I-94 and I-35W Interchange	44	29	39
94 Commons	DS16	I-35W and Portland Ave	130	130	128
Summation			2853	2822	2808

[1] 2014 Existing Conditions (Atlas 14)
[2] Rates are lower as a result of profile changes which cause changes in drainage areas and increases to HWLs

Table 23
Proposed 50-Year Discharge Rates Results

Segment	XP-SWMM Node Name	Location	50-year Peak Discharge Rate (cfs)		
			2014 Existing Conditions[1]	Proposed Conditions[2]	Proposed Conditions with Basins
Gap	DS1 (39th)	I-35W and 39th Street	1352	1306	1353
Gap	DS2(35th)	I-35W and 35th Street	849	854	865
Transit/ Access	DS3(31st)	I-35W and 31st Street	487	491	486
Transit/ Access	DS4(27th)	I-35W and 27th Street (Wells Fargo Site)	837	828	827
94 Commons	DS15	I-94 and I-35W Interchange	63	45	57
94 Commons	DS16	I-35W and Portland Ave	141	141	148
Summation[3]			3731	3664	3736

[1]2014 Existing Conditions (Atlas 14)
[2] Rates are lower as a result of profile changes which cause changes in drainage areas and increases to HWLs
[3] MWMO does not require rate control to be met for the 50-year event

Table 24
Proposed 100-Year Discharge Rates Results

Segment	XP-SWMM Node Name	Location	100-year Peak Discharge Rate (cfs)		
			2014 Existing Conditions[1]	Proposed Conditions[2]	Proposed Conditions with Basins
Gap	DS1 (39th)	I-35W and 39th Street	1382	1389	1381
Gap	DS2(35th)	I-35W and 35th Street	1017	1011	1002
Transit/ Access	DS3(31st)	I-35W and 31st Street	611	618	602
Transit/ Access	DS4(27th)	I-35W and 27th Street (Wells Fargo Site)	893	887	867
94 Commons	DS15	I-94 and I-35W Interchange	67	49	69
94 Commons	DS16	I-35W and Portland Ave	152	151	148
Summation			4121	4105	4069

[1]2014 Existing Conditions (Atlas 14)
[2] Rates are lower as a result of profile changes which cause changes in drainage areas and increases to HWLs

5.4.2.2 94 Commons

The peak discharge rates at dropshaft DS16 and DS15 within the 94 Commons segment were highly variable based on the storm event. While the 100-year storm event did not show an increase in rates, the 2- and 10-year storm event showed an increase in rates between existing and proposed conditions. With the filtration basins in place, the peak discharge rates at dropshaft DS15 decreased from existing conditions during all three storm events. DS16 saw variable results with

the rate control structures in place, and a decrease in rates from existing conditions for the 2-year storm event, but increased by 0.1-0.5 cfs for the 10- and 100-year storm events.

5.4.2.3 Transit/Access

The peak discharge rates at dropshaft DS3 (31st) and DS4 (27th) within the Transit/Access segment were variable based on storm event as well. The 31st Street dropshaft, DS3, saw an increase between existing and proposed during all three storm events. This is due to the large impervious increase in this area. The DS4 dropshaft is downstream of the North filtration basin and saw a decrease in peak discharge rates from existing to proposed conditions as a result of the filtration basins.

5.4.2.4 Gap

The Gap segment saw a general increase in peak discharge rates from existing to proposed conditions. Because there is not a filtration basin located directly within the Gap segment, the peak discharge rates in this segment were not as sensitive to the placement of the filtration basins.

5.4.3 High Water Levels

The two recommended filtration basins were modeled within XP-SWMM to determine the proposed conditions high water levels to evaluate flooding impacts. A detailed summary of high water levels in the Corridor for the 100-year storm is located in Table 25. 100-year high water levels for the filtration basins are also noted in Figures 16 and 17 in Appendix A. A summary of all storms existing and proposed conditions high water levels at the drop shafts and critical sag points within the Corridor is located in Table 27. A complete summary of the node results for the 50-year and 100-year storm events is located in Table B6 – XP-SWMM Link Results within Appendix B.

In addition to high water levels, the drawdown times for the high water levels at the drop shafts and critical sag points are summarized in Table 26 for all storm events to identify pre- and post-project conditions.

While the addition of the filtration basins did help mitigate high water level increases in general throughout the project, there were a number of areas where storm sewer improvements were necessary. These improvements consisted of lowering and/or upsizing existing storm sewer. The proposed storm sewer improvements are described in Table 28 and can be seen in Figures 18, 19 and 20 in Appendix A. HGL profiles are shown in Figures 31, 32, 33 and 34 for existing and proposed conditions.

Overall, the project met the criteria described in Section 2.3.1.3. During the 100-year storm event, areas flooding during existing conditions saw no increase in flooding depths in proposed conditions. Additionally, during the 50-year storm event, the trunk storm sewer systems maintained 0.5 feet of freeboard.

Table 25
Proposed 100-year High Water Level Summary

Location	Node Name	100 year - High Water Level Summary (ft)										
		2014 Existing Conditions[2]			Proposed Conditions							
					Proposed Conditions[3]				Proposed Conditions with Basins			
		TOC	HWL	FB [(1)]	TOC	HWL	FB [(1)]	Δ	TOC	HWL	FB[(1)]	Δ
13th and 94- Drop Shaft	DS6	840.9	804.6	36.3	840.9	804.5	36.4	-0.1	840.9	804.7	36.2	0.0
18th and Clinton- Drop Shaft	DS14	856.5	823.0	33.5	856.5	822.7	33.8	-0.3	856.5	822.8	33.7	-0.2
I94/35W at Portland Ave	DS16	810.9	820.6	-9.7	810.9	820.3	-9.5	-0.3	810.9	820.5	-9.6	-0.1
22nd and 35W	22-35W	865.9	870.5	-4.6	866.9	869.9	-3.0	-0.6	866.9	869.3	-2.4	-1.2
27th and 35W- Drop Shaft	DS4 (27th)	859.0	837.9	21.1	859.0	837.6	21.4	-0.3	859.0	837.5	21.5	-0.5
31st and 35W- Drop Shaft	DS3 (31st)	864.5	840.5	24.0	864.7	840.4	24.2	-0.1	864.7	840.2	24.4	-0.3
35th and 35W- Drop Shaft	DS2 (35th)	840.1	840.6	-0.5	840.1	840.5	-0.4	0.0	840.1	840.4	-0.3	-0.1
39th and 35W- Drop Shaft	DS1 (39th)	838.1	838.6	-0.5	838.1	838.6	-0.5	0.0	838.1	838.6	-0.5	0.0
42nd St and 35W- Low Point	42nd	821.7	832.9	-11.2	822.0	835.1	-13.1	2.2	822.0	832.7	-10.7	-0.1
46th St and 35W- Low Point	B5565	829.3	833.1	-3.8	829.3	833.5	-4.2	0.4	829.3	833.0	-3.8	0.0

[(1)]Negative freeboard depicts depth of flooding above casting
[(2)] Model: 2014 Existing Conditions (Atlas 14)
[(3)] Model: Proposed Conditions Model
[(4)] Model: Proposed Conditions Model with Rate Control Structures

Table 26
Proposed Conditions Drawdown Times

Location	Node Name	TOC	Drawdown Time (min)											
			2014 Existing Conditions[1]				Proposed Conditions[2]				Proposed with Rate Control Structures[3]			
			5-year	10-year	50-year	100-year	5-year	10-year	50-year	100-year	5-year	10-year	50-year	100-year
13th and 94- Drop Shaft	DS6	840.9	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
18th and Clinton- Drop Shaft	DS14	856.5	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
I94/35W at Portland Ave	DS16	810.9	NF	26	53	68	NF	25	53	68	NF	25	53	69
22nd and 35W	22-35W	865.9	NF	5	22	34	NF	NF	11	16	NF	NF	5	13
27th and 35W- Drop Shaft	DS4 (27th)	859.0	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
31st and 35W- Drop Shaft	DS3 (31st)	864.5	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF	NF
35th and 35W- Drop Shaft	DS2 (35th)	840.1	NF	NF	NF	20	NF	NF	NF	29	NF	NF	NF	NF
39th and 35W- Drop Shaft	DS1 (39th)	838.1	NF	NF	54	75	NF	NF	55	74	NF	39	74	95
42nd St and 35W- Low Point	42nd	821.7	1	219	388	488	75	212	363	449	74	221	383	485
46th St and 35W- Low Point	B5565	829.3	NF	157	341	437	NF	196	370	475	NF	137	323	430

NF = No Flooding
(1) Model: 2014 Existing Conditions (Atlas 14)
(2) Model: Proposed Conditions Model
(3) Model: Proposed Conditions Model with Rate Control Structures

Table 27
Proposed Conditions High Water Levels

Location	Node Name	TOC	High Water Level (ft)											
			2014 Existing Conditions[1]				Proposed Conditions[2]				Proposed with Basins			
			5-year	10-year	50-year	100-year	5-year	10-year	50-year	100-year	5-year	10-year	50-year	100-year
13th and 94-Drop Shaft	DS6	840.9	791.1	797.1	802.0	804.6	791.0	785.9	801.9	804.5	790.8	797.1	802.0	804.7
18th and Clinton-Drop Shaft	DS14	856.5	811.0	816.7	821.0	823.0	810.6	816.6	820.9	822.8	810.4	816.7	821.0	822.8
I94/35W at Portland Ave	DS16	810.9	808.7	814.2	818.5	820.6	808.1	814.1	818.4	820.3	808.0	814.0	818.5	820.5
22nd and 35W	22-35W	865.9	860.4	867.0	869.8	870.5	855.3	862.1	868.7	869.9	853.0	859.2	867.6	869.3
27th and 35W-Drop Shaft	DS4(27th)	859.0	825.0	831.8	835.9	837.9	823.4	831.7	835.7	837.6	822.8	831.4	835.8	837.5
31st and 35W-Drop Shaft	DS3(31st)	864.5	829.1	935.2	838.8	840.5	826.7	835.3	838.8	840.4	826.4	835.1	838.6	840.2
35th and 35W-Drop Shaft	DS2(35th)	840.1	831.1	836.7	839.3	840.6	828.6	836.7	839.3	840.5	828.3	836.6	839.2	840.4
39th and 35W-Drop Shaft	DS1(39th)	838.1	831.3	836.7	838.6	838.6	829.0	836.8	838.6	838.6	828.6	836.7	838.6	838.6
42nd St and 35W-Low Point	42nd	821.7	825.6	829.2	831.9	832.9	825.8	829.3	831.9	832.9	825.4	829.2	831.7	832.7
46th St and 35W-Low Point	B5565	829.3	828.2	831.2	832.6	833.1	829.3	831.7	832.9	833.3	828.3	831.2	832.6	833.0

(1) Model: 2014 Existing Conditions (Atlas 14)
(2) Model: Proposed Conditions Model reflecting profile and impervious surface area changes
(3) Model: Proposed Conditions Model with Filtration Basins

Table 28
Proposed Storm Sewer Improvements

Segment	XPSWMM Link Name	Existing Storm Sewer Size[1] (ft)	Proposed Storm Sewer Size[2] (ft)	Notes
94 Commons	L40	4	4	Lower Storm Sewer
94 Commons	L23	4	4	Lower Storm Sewer
94 Commons	L156	2.5	2.5	Lower Storm Sewer
94 Commons	L22	2	2	Lower Storm Sewer
94 Commons	L18	4	4	Lower Storm Sewer
94 Commons	L15	2	2	Lower Storm Sewer
94 Commons	L155	3	3	Reroute Storm Sewer into North Pond, lower
94 Commons	5762.1	2.5	2.75	Upsize Storm Sewer
94 Commons	5764.1	2.5	2.75	Upsize Storm Sewer
94 Commons	5765.1	2.5	2.75	Upsize Storm Sewer
94 Commons	5773.1	3	3.25	Upsize Storm Sewer
Transit Access	M15022	4	4.5	Upsize Storm Sewer
Transit Access	L135-1	2.25	3	Upsize Storm Sewer
Transit Access	L159-1	2.25	3	Upsize Storm Sewer
94 Commons	5780.1	2	3	Upsize Storm Sewer
94 Commons	5781.1	2	3	Upsize Storm Sewer
94 Commons	5784.1	1.5	3	Upsize Storm Sewer
Gap	Lead Lines	1-1.5	1-2	Connect into Existing Storm Sewer
Note: Only trunk storm sewer lines are included in this table				

[1]Model: 2014 Existing Conditions (Atlas 14)

[2]Model: Proposed Conditions Model with Rate Control Structures

5.4.3.1 94 Commons

A number of storm sewer improvements are proposed within the 94 Commons area. This includes lowering the storm sewer from 24th Street to 22nd Street. The lowering of the storm sewer is necessary to provide adequate cover over the pipe, as the cover was impacted by lowering of the roadway profile in this area. See Figures 18, 19, 20 in Appendix A for storm sewer improvement areas.

5.4.3.2 Transit/Access

The proposed roadway widening and increased impervious surface area caused localized flooding at 31st Street west of the Corridor. The detailed flooding results can be seen in Table B6 in Appendix B. The flooding at this location was reduced to no more than existing conditions by upsizing three pipes per Table 28. See Figures 18-20 in Appendix A for storm sewer improvement areas.

5.4.3.3 Gap

There were no additional storm sewer improvements recommended within the Gap segment beyond the storm sewer modifications to accommodate the shoulder widening.

6.0 Final Design Considerations

6.1 Preliminary Cost Estimate

A preliminary cost estimate was prepared for the preliminary drainage design and is located in Appendix J. It was completed using MnDOT Average Bid Prices from 2012-2014, and calculated in 2014 dollars. The costs are separated into three sections: Filtration Basins, SPCDs, and Storm Sewer Infrastructure, with costs summed by individual project segment as well as an overall total. A summarized cost estimate is in Table 29.

The estimate was prepared assuming the storm sewer trunkline improvements included in Table 28. Any future trunkline modifications will have to be analyzed because changes in the storm sewer system, will affect the peak discharge rates and high water levels of the system.

Table 29
Preliminary Cost Estimate

Item Subtotals	94 Commons Totals	Transit/Access Totals	Gap Totals	Total Cost
Filtration Basins	$ 534,119.96	$ 170,563.01	$ -	$ 704,682.96
SPCDs	$ 105,500.00	$ 150,250.00	$ 83,250.00	$ 339,000.00
Storm Sewer Infrastructure	$ 1,585,210.00	$ 950,600.00	$ 1,108,000.00	$ 3,643,810.00
Project Subtotal	$ 2,224,900.00	$ 1,271,500.00	$ 1,191,300.00	$ 4,688,000.00
Contingency-30%	$ 667,470.00	$ 381,450.00	$ 357,390.00	$ 1,406,400.00
Cost per Project Segment	$ 2,892,400.00	$ 1,653,000.00	$ 1,548,700.00	
Estimated Cost				**$ 6,095,000.00**

6.2 Soil Borings

Soil borings are recommended to be taken at the filtration basins for the sheet pile retaining walls and to determine the soil properties for the excavated material. Based on the soil borings obtained in the vicinity of the filtration basins, the groundwater table is more than 10 feet below the basin bottom. Only one of the soil borings was taken directly in the location of a proposed filtration basin therefore additional soil borings are recommended to verify groundwater conditions do not pose any issues with the long term functionality of the basins. Appendix G contains the preliminary soil boring data obtained within the vicinity of the filtration basins.

6.3 Detailed Survey

A detailed survey of the existing storm sewer system will need to be done prior to final design. The condition of the pipes will need to be determined to identify storm sewer pipes that need to be replaced as part of the project.

6.3.1 Topography

Topographic and LiDAR data was used in the design of this project. Any updated topography or LiDAR data should be utilized and the preliminary drainage design updated accordingly.

6.3.2 Utilities

The drainage features outlined in the report were designed and locations selected based on limited utility information. Verify the location of public and private utilities during final design.

6.4 Drainage System Design

The goal of the drainage design was to utilize existing storm sewer to minimize cost, and disruption to the maintenance of traffic during construction per guidance from Project Stakeholders. The existing storm sewer system was not inspected prior to the release of this Study therefore the extent of replacing existing deficient storm sewer as a result of poor condition was unknown. The cost estimate was based on utilizing the existing storm sewer system where possible and supplementing it with laterals, manholes and catch basins as need to collect and convey drainage to meet the spread requirements. MnDOT Technical Memorandum No. 11-14-B-05 has been included in Appendix C outlining the spread requirements for Interstate highways. Per the technical memorandum, spread is required to be confined to the shoulder on Interstate highways for a 10-year event and for a 50-year event at true sag points. A design exemption will need to be obtained for the 50-year true sag point requirement. Even though the sag points flood currently for the 50-year event, it is recommended to design the catch basins in these area to meet the standard assuming a free outfall condition. Once a solution to the tunnel capacity issue has been constructed, this will enable the Interstate to meet the spread requirements without having to complete any additional catch basin improvements.

The roadway design for the Gap segment is to complete a partial depth pavement replacement, only removing the upper layers of the bituminous pavement section to accommodate a new concrete section. In addition, the roadway is proposed to be widened to accommodate a 10 foot shoulder along the outside. Therefore the existing catch basins will not fit the new roadway width. New catch basins will need to be installed at the proposed curb line. The median area is being narrowed through the Gap segment so additional catch basins have been incorporated into the cost estimate to reflect the need to meet spread for the narrowed shoulder (5.9 feet). To minimize disturbance along the median, it is anticipated that two catch basins would be placed at each lateral crossing to reduce spread. The catch basins would be placed with approximate 20 feet of separation. The existing spacing between the laterals in the Gap segment varies from 150 feet to 300 feet. Additional catch basins have been included in the cost estimate to “double up” the existing catch basins locations.

The final design will need to determine the exact spacing of the catch basin locations throughout each project segment to meet the criteria outlined in the MnDOT Technical Memorandum.

6.5 SPCD Maintenance

The SPCDs were located with the intent to be easily accessible for maintenance and upkeep. Based on site conditions in some drainage areas, the SPCDs are not in locations conducive to easy access. In those situations, a lane closure would be recommended for accessing the SPCD. The table below provides detailed SPCD location information that will guide lane closure decisions.

Table 30
SPCD Location Information

SPCD No.	Station	Offset	Alignment	Shoulder Width (ft)	Includes Curb	Adjacent Lane Width (ft)	Pull-Off Available for Access & Maintenance	Lane Closure Anticipated
1	624+18	57.2 LT	SB35W	10	Yes	11		
2	650+47	49.9 RT	NB35W	4	Yes	11	Yes	
3	650+92	51.7 LT	SB35W	3	Yes	12	Yes	
6	675+88	114.5 LT	SB35W	1.5	Yes	11	Local Road	X
7	676+16	139.2 RT	NB35W	1.5	Yes	11	Local Road	X
12	685+15	57.9 RT	NB35W	10	Yes	12		
13	695+32	42.7 RT	NB35W	10	Yes	12		
15	703+12	56.3 RT	NB35W	10	Yes	12		
16	703+89	60.4 RT	NB35W	10	Yes	12		
17	738+63	77.3 LT	NB35W	10	No	12		
18	746+33	110.7 LT	NB35W	6	Yes	12	Yes	
19	240+27	33.8 RT	WB94	10	Yes	12	Yes	
20	749+47	16.9 LT	NB35W	8.5	No	12	Yes	
21	754+68	17.42 RT	NB35W	12	Yes	12		X

6.6 I-35W Tunnel System

6.6.1 On Going Analysis

The I-35W Tunnel is clearly substandard based on this and many past studies showing the capacity issues the existing tunnel has. The tunnel surcharges and floods the I-35W roadway for events less than a 10-year event based on the XP-SWMM analysis. As a result I-35W is prone to flooding during frequent rainfall events. MnDOT has invested in measures (surge chambers) to cause the geysering to occur within the surge chambers but the major capacity issue remains, limited capacity within the tunnel. The reason for this is that the preliminary estimates exceed $60 million dollars to increase the capacity of the tunnel system and mitigate the flooding issues. MnDOT is continuing to study the tunnel system to determine the most cost effective solution. However, funding for such a system is unlikely.

6.6.2 Future Model Use

It should be noted that the XP-SWMM model used in this design corresponds with the Study Area preliminary roadway design. All future projects that are proposed within this tunnelshed need to be analyzed to determine that they are not increasing the discharge rates and volumes to the system, ultimately impacting downstream areas. Once projects are designed and constructed, the model will need to be updated accordingly to reflect any changes within the system. Close coordination with agencies is vital to ensure that all changes to the storm sewer system are accurately reflected within the existing conditions model, ensuring that future analyses on the system are being completed based on the actual storm sewer infrastructure in place given the sensitivity and complexity of the system.

Any future projects must be analyzed and discussed with MnDOT and the City to ensure that no additional stormwater will be added to the tunnel system.

7.0 References

City of Minneapolis. (2014, March 25). *Chapter 54. Stormwater Management.* Retrieved from City of Minneapolis Minnesota Ordinance: http://www.minneapolismn.gov/www/groups/public/@publicworks/documents/webcontent/convert_253841.pdf

City of Minneapolis. (2014, March 27). *Chapter 54: Stormwater Management for Development and Re-develoment*. Retrieved from Minneapolis: City of Lakes: http://www.minneapolismn.gov/publicworks/stormwater/dev/stormwater_stormwater-management-for-projects_index

Minnesota Department of Transportation. (2014, May 9). *Hydraulics*. Retrieved from Minnesota Department of Transportation: http://www.dot.state.mn.us/bridge/hydraulics/drainagemanual.html

Minnesota Pollution Control Agency. (2014, March 25). *Stormwater Program for Construction Activity.* Retrieved from Construction Stormwater General Permit 2013: http://www.pca.state.mn.us/index.php/view-document.html?gid=18984

Mississippi Watershed Management Organization. (2014, March 25). *MWMO Publications.* Retrieved from Watershed Management Plan 2011-2021: http://www.mwmo.org/docs.html

MNDOT. (2014, May 14). *Atlas 14 - Precipitation Data Frequency Server Rainfall Distributions .* Retrieved from MNDOT Bridge Hydraulics Web Page: http://www.dot.state.mn.us/bridge/pdf/hydraulics/Atlas14_RainfallDistributions.pdf

Natural Resources Conservation Service. (2014, March 25). *NRCS Web Soil Survey.* Retrieved from Hennepin County: http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

SRF. (2005). *XP-SWMM Hydrology and Hydraulics Model Development Manual.* Minneapolis: City of Minneapolis Public Works Department.

SRF Consulting Group Inc. (2006). *I-35W and St. Mary's Storm Tunnel STudy.* SRF Inc.

SRF Consulting Group Inc. (2006). *West Lake Stormwater Analysis.* SRF Inc.

William W. Walker, J. P. (2014, March 27). *P8 Urban Catchment Model*. Retrieved from P8: http://www.wwwalker.net/p8/

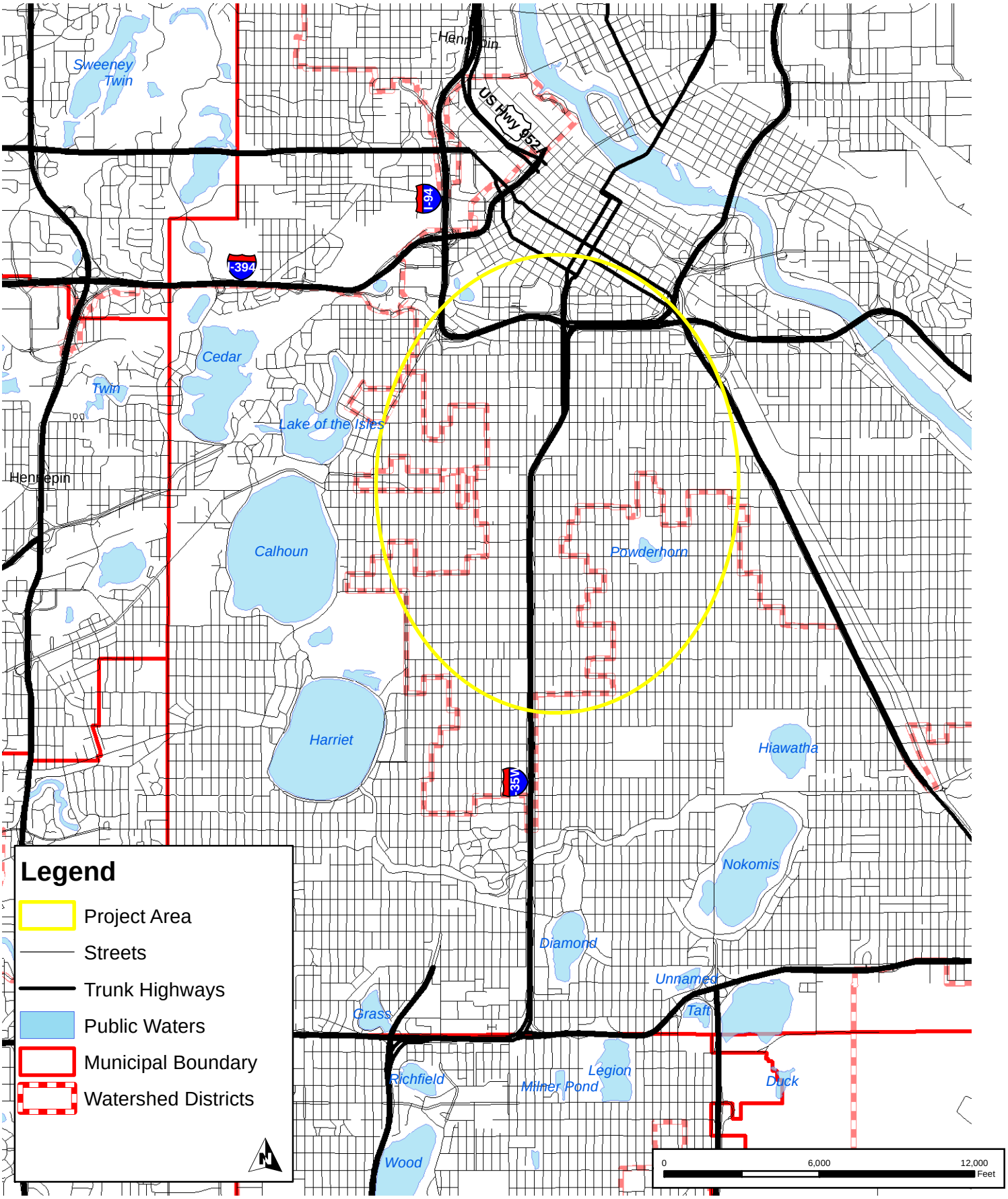
XP Solutions. (2013, March 27). *Version Changes History*. Retrieved from XPSolutions: http://www.xpsolutions.com/wp-content/uploads/docs/Version%20Changes2013.pdf

XP Solutions. (2013, March 27). *XP Solutions GETTING STARTED MANUAL*. Retrieved from http://www.xpsolutions.com/wp-content/uploads/trials/xpswmm-gsm2012-metric.pdf

Appendix A

Figures

Figure 1 – Project Location
Figure 2 – Study Area
Figure 3 – Existing Drainage Areas
Figure 4 – Proposed Drainage Areas
Figure 5 – Existing Impervious Breakdown of 94 Commons
Figure 6 – Proposed Impervious Breakdown of 94 Commons
Figure 7 – Existing Impervious Breakdown of Transit Access
Figure 8 – Proposed Impervious Breakdown of Transit Access
Figure 9 – Existing Impervious Breakdown of Gap
Figure 10 – Proposed Impervious Breakdown of Gap
Figure 11 – XPSWMM Routing Diagram
Figure 12 – 94 Commons SPCD Locations
Figure 13 – Transit Access SPCD Locations
Figure 14 – Gap SPCD Locations
Figure 15 – Noise Walls
Figure 16 – Filtration Basin Design- 24th Street Basin
Figure 17 – Filtration Basin Design –33rd Street North and South Basin
Figure 18 – Drainage System Improvements 94 Commons
Figure 19 – Drainage System Improvements Transit Access
Figure 20 – Drainage System Improvements Gap
Figure 21 – Gap Segment Typical Section
Figure 22 – Proposed Improvements Detail 1
Figure 23 – Proposed Improvements Detail 2
Figure 24 – Proposed Improvements Detail 3
Figure 25 – Proposed Improvements Detail 4
Figure 26 – Proposed Improvements Detail 5
Figure 27 – Proposed Improvements Detail 6
Figure 28 – Proposed Improvements Detail 7
Figure 29 – 94 Commons Profile
Figure 30 – 94 Commons Profile
Figure 31 – Existing Conditions Hydraulic Grade Line – Pre-Tunnel
Figure 32 – Existing Conditions Hydraulic Grade Line – Tunnel
Figure 33 – Proposed Conditions Hydraulic Grade Line – Pre-Tunnel
Figure 34 – Proposed Conditions Hydraulic Grade Line – Tunnel
Figure 35 – Critical Locations



Path: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Figures\Figure 1 - Project Location.mxd

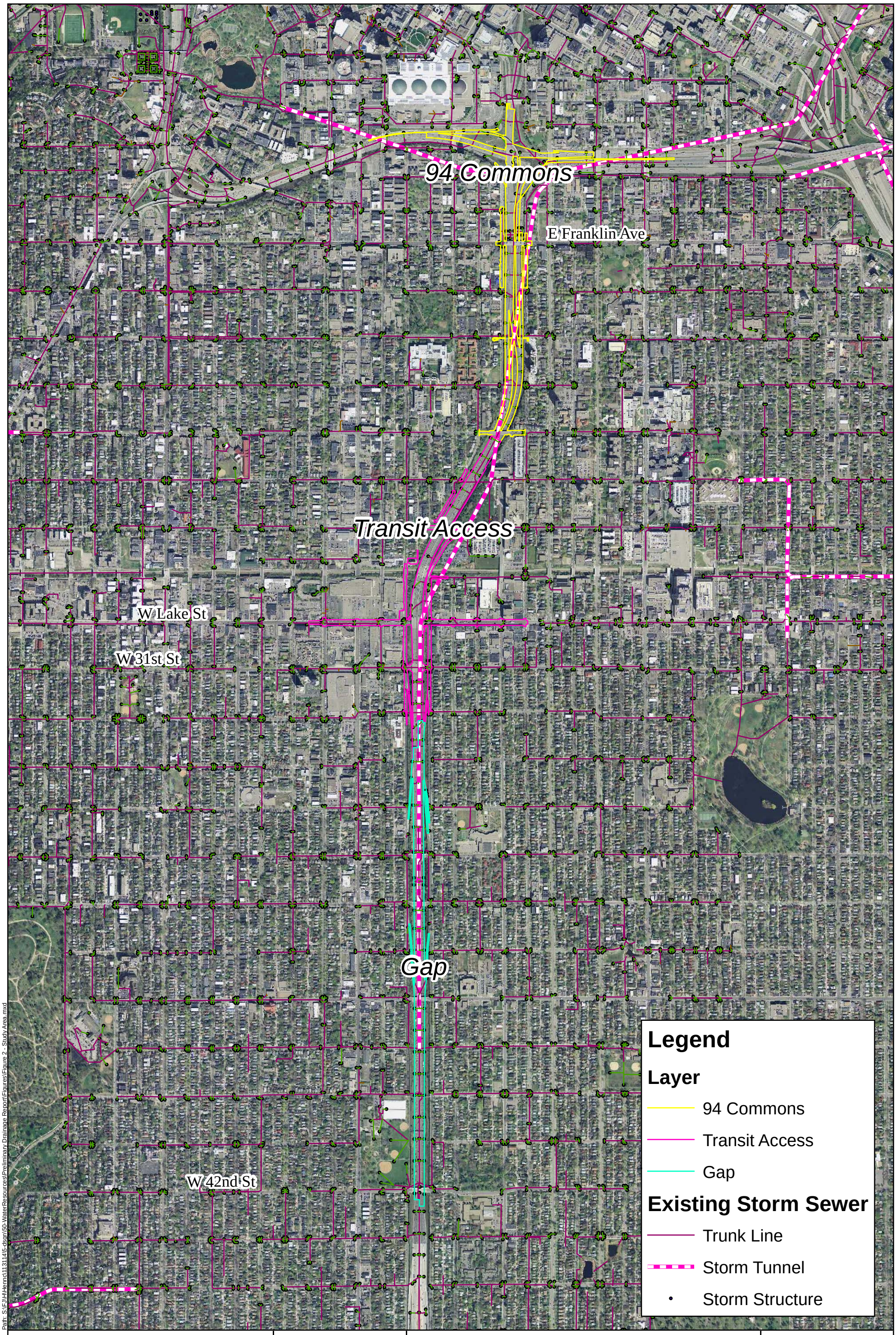
Project Number: HENNC 113114
Print Date: 5/14/2014

Map by: amh
Projection: Lambert_Conformal_Conic
Source: SEH

I-35W Corridor Study
Hennepin County, Minnesota

FIGURE 1
Project Location

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.



Path: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Figures\Figure 2 - Study Area.mxd

SEH
3535 VADNAIS CENTER DR.
ST. PAUL, MN 55110
PHONE: (651) 490-2000
FAX: (888) 908-8166
TF: (800) 325-2055
www.sehinc.com

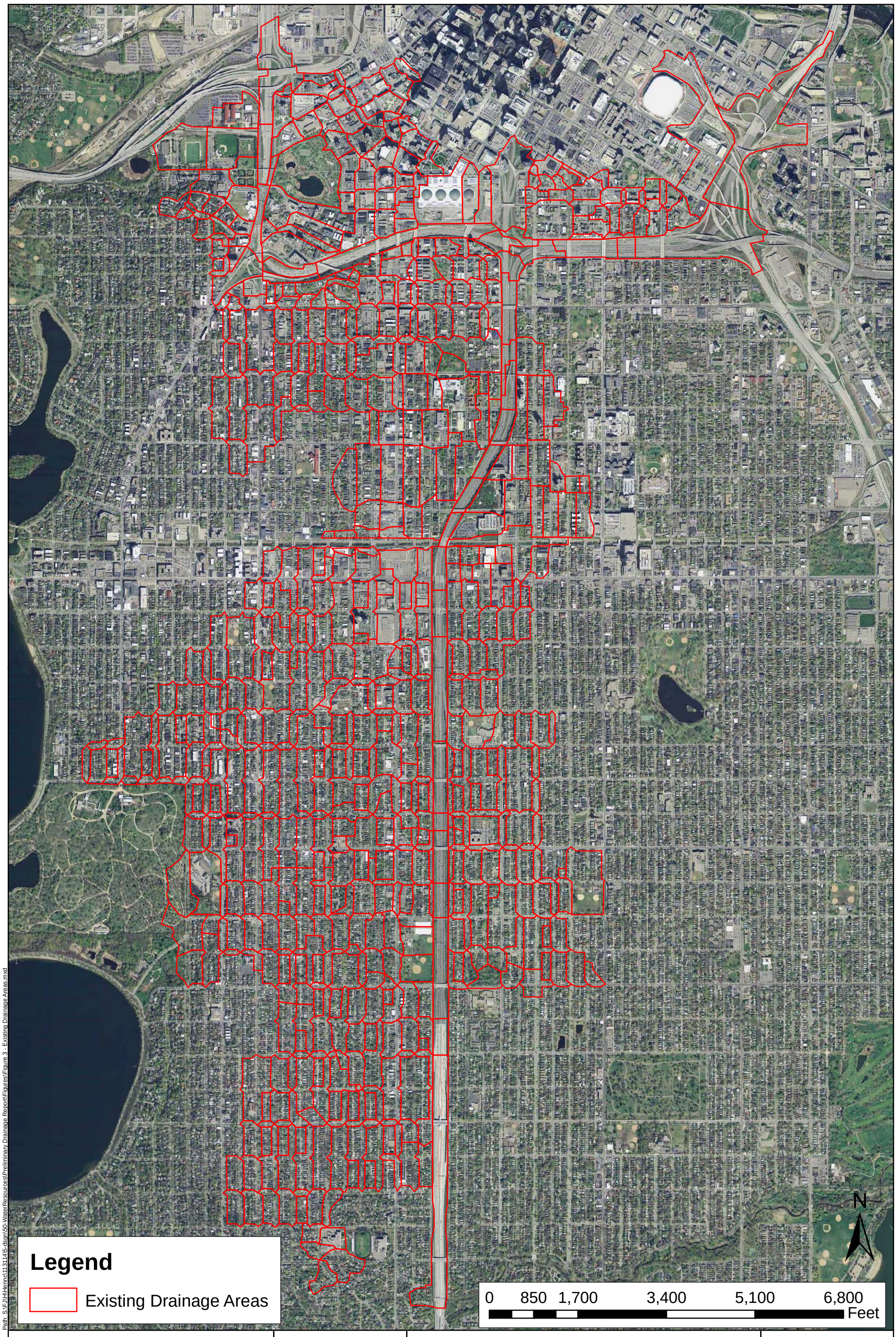
Project: Hennc 113114
Print Date: 5/22/2014

Map by: amh
Projection: Lambert Conformal Conic
Source: SEH Inc

Drainage Study Area
I-35W Transit Access
Hennepin County, Minnesota

Figure 2

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.



Path: S:\FJH\Hennc\1131145-dsgn\50-WaterResources\Preliminary Drainage Report\Figures\Figure 3 - Existing Drainage Areas.mxd

SEH
3535 VADNAIS CENTER DR.
ST. PAUL, MN 55110
PHONE: (651) 490-2000
FAX: (888) 908-8166
TF: (800) 325-2055
www.sehinc.com

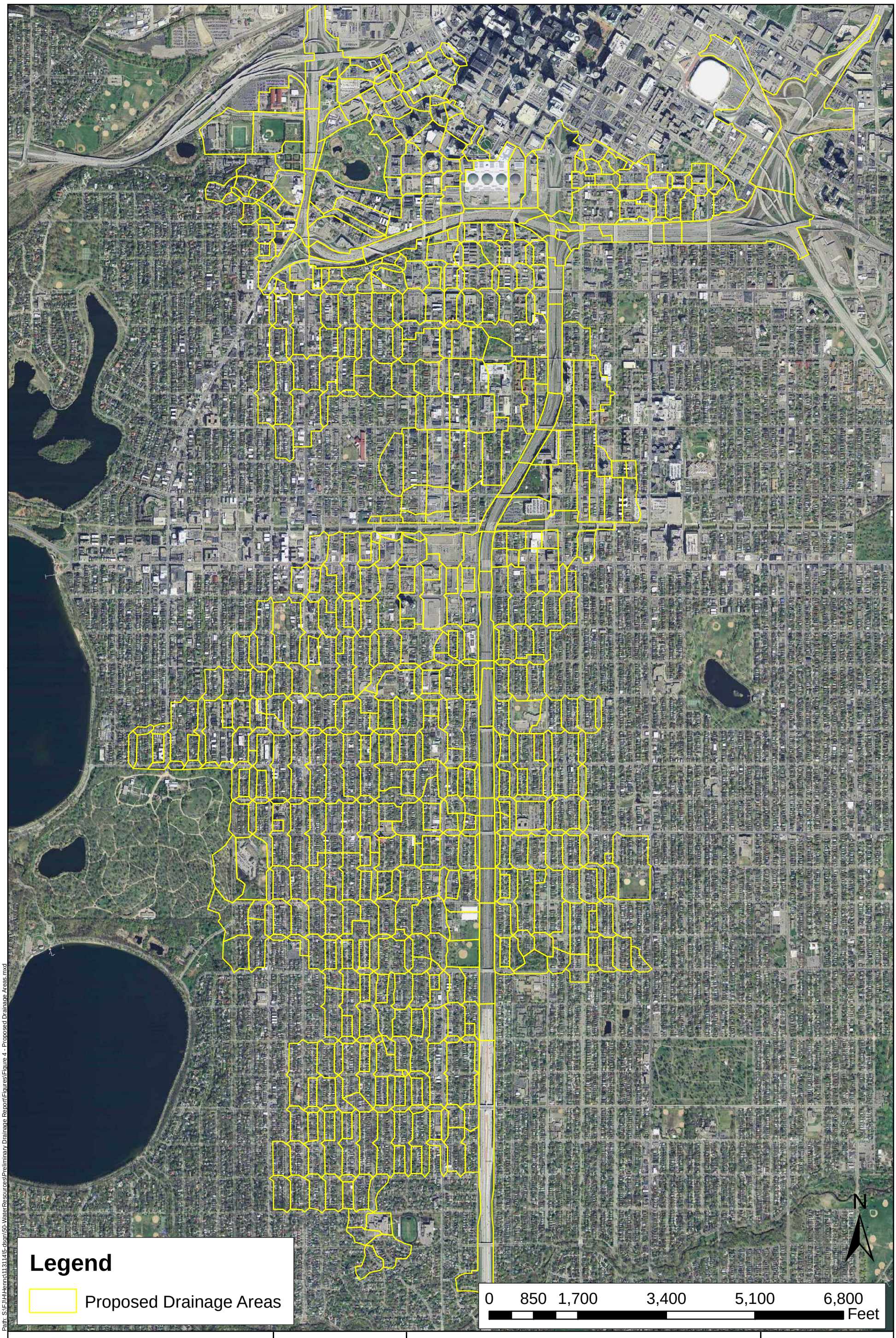
Project: Hennc 113114
Print Date: 5/22/2014

Map by: amh
Projection: Lambert Conformal Conic
Source: SEH Inc

Existing Drainage Areas
I-35W Transit Access
Hennepin County, Minnesota

Figure
3

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.



Path: S:\F:\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Figures\Figure 4 - Proposed Drainage Areas.mxd

SEH
3535 VADNAIS CENTER DR.
ST. PAUL, MN 55110
PHONE: (651) 490-2000
FAX: (888) 908-8166
TF: (800) 325-2055
www.sehinc.com

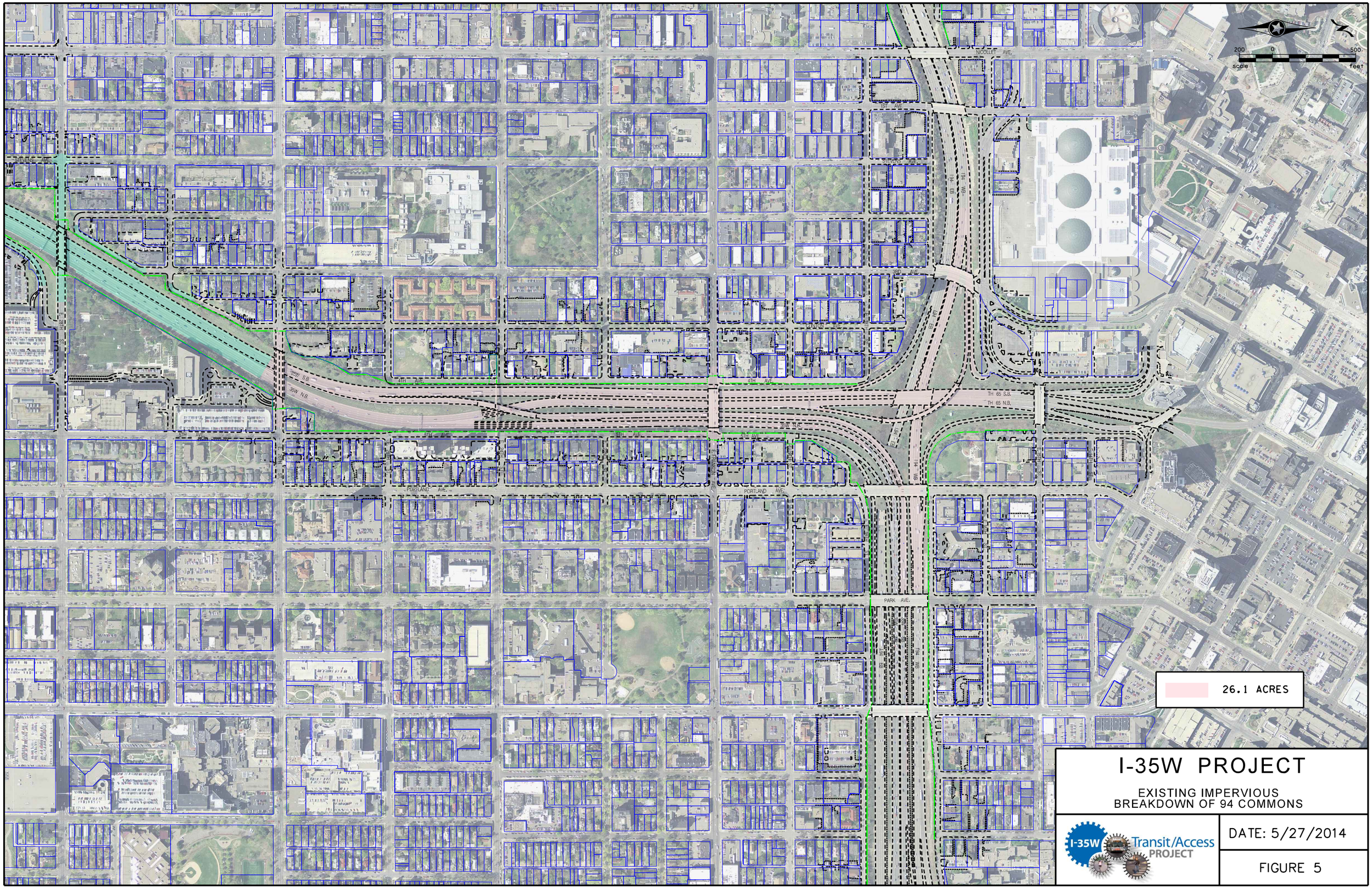
Project: Hennc 113114
Print Date: 5/22/2014

Map by: amh
Projection: Lambert Conformal Conic
Source: SEH Inc

Proposed Drainage Areas
I-35W Transit Access
Hennepin County, Minnesota

Figure 4

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.



I-35W PROJECT

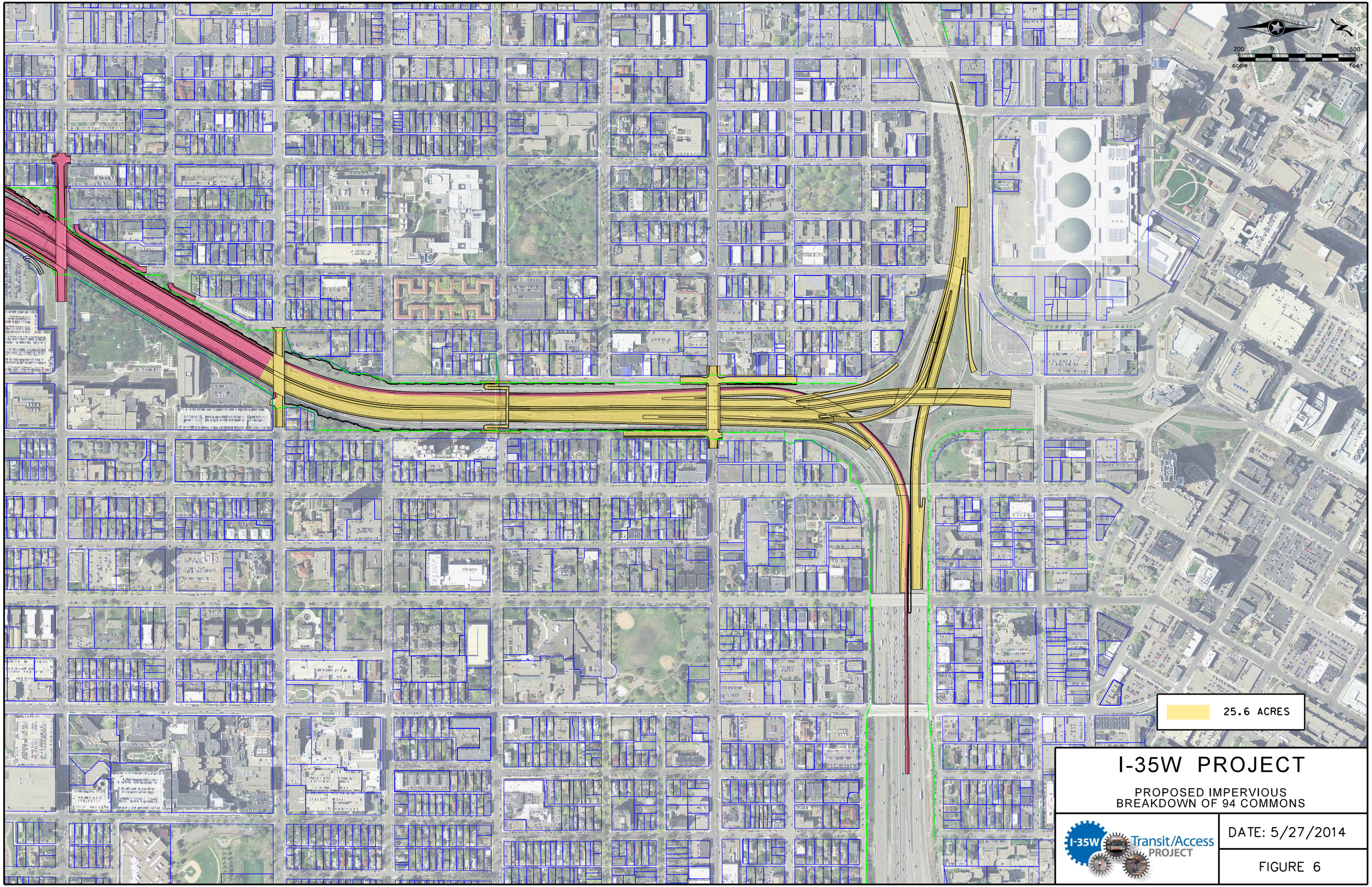
EXISTING IMPERVIOUS
BREAKDOWN OF 94 COMMONS

I-35W Transit/Access PROJECT

DATE: 5/27/2014

FIGURE 5

11:25:25 AM
5/27/2014
rbrooks
S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\CAD\WR figures\Imp figure.dgn
3.NORTH SEGMENT



I-35W PROJECT

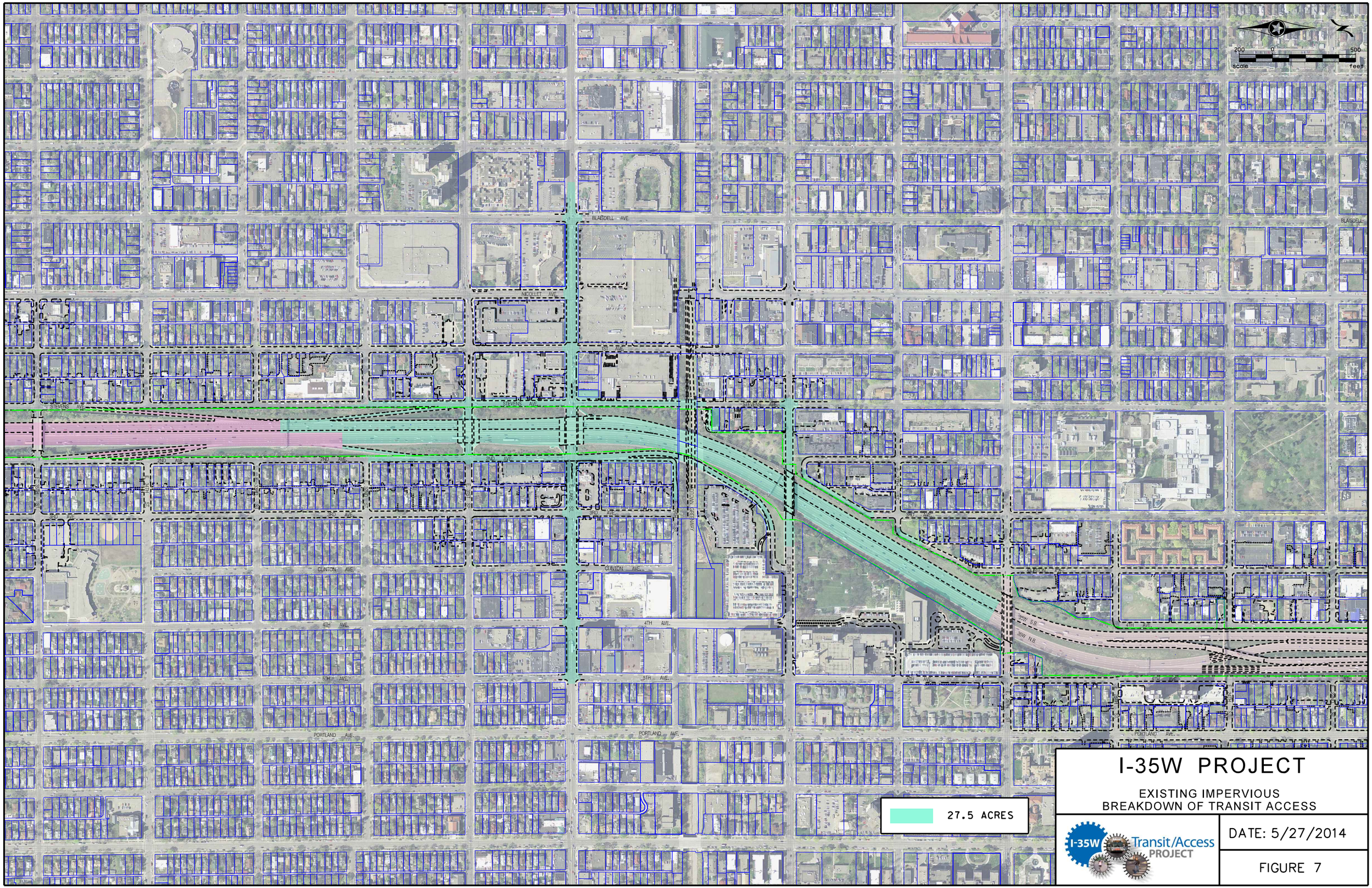
PROPOSED IMPERVIOUS
BREAKDOWN OF 94 COMMONS

I-35W Transit/Access PROJECT

DATE: 5/27/2014

FIGURE 6

11:30:12 AM
5/27/2014
rbrooks
S:\FJ\NH\Hennc\1131114\5-dsgn\50-WaterResources\CADWR figures\Prop figure.dgn
3.NORTH SEGMENT



I-35W PROJECT

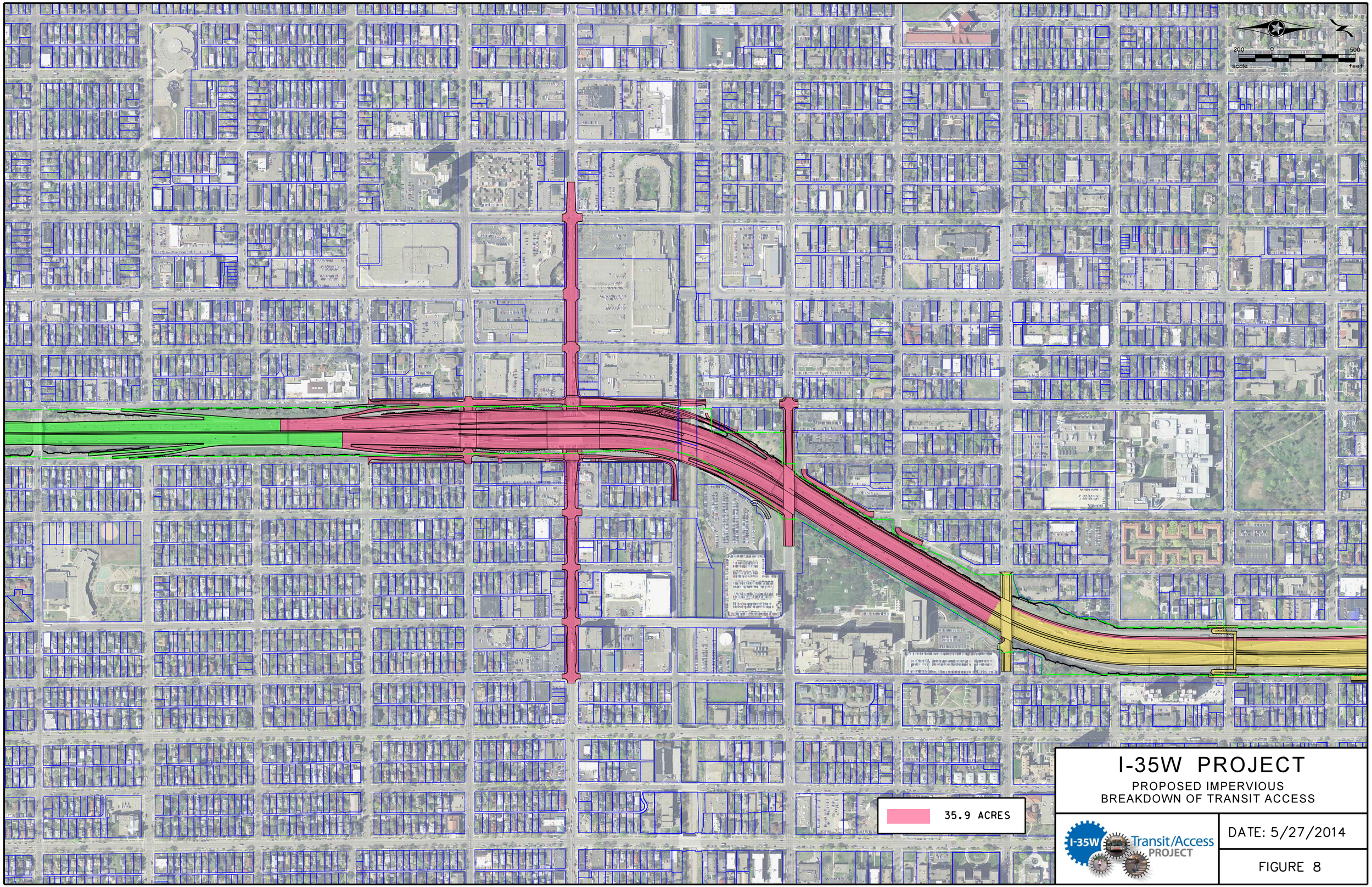
EXISTING IMPERVIOUS
BREAKDOWN OF TRANSIT ACCESS

I-35W Transit/Access PROJECT

DATE: 5/27/2014

FIGURE 7

S:\F_J\H\Hennc\113114\5-dsgn\50-WaterResources\CAD\WR figures\Imp figure.dgn
2_LAKE ST SEGMENT
rbrooks
5/27/2014
11:23:19 AM



I-35W PROJECT

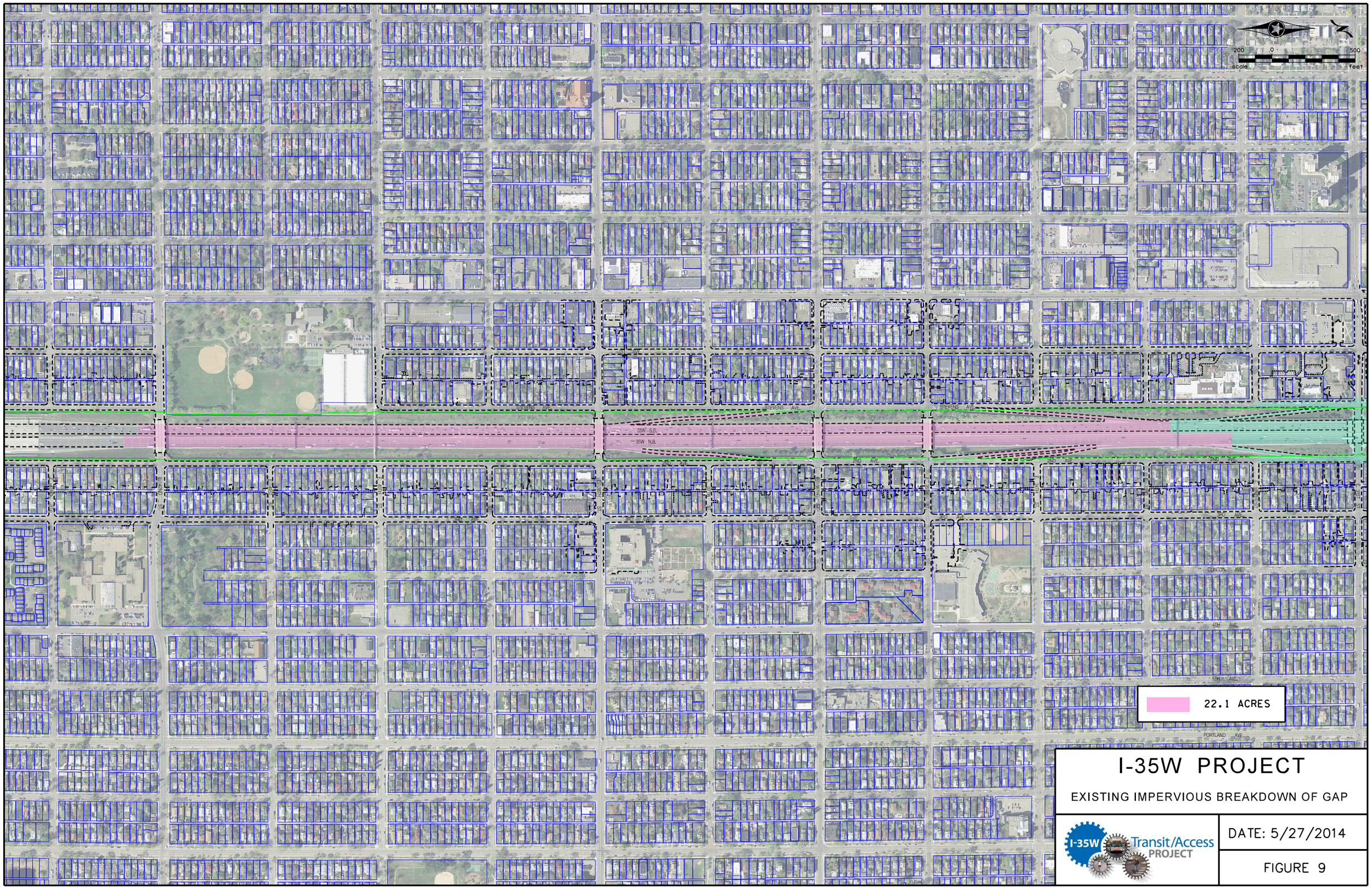
PROPOSED IMPERVIOUS
BREAKDOWN OF TRANSIT ACCESS

I-35W Transit/Access PROJECT

DATE: 5/27/2014

FIGURE 8

11:28:49 AM
5/27/2014
rbrooks
S:\F_J\H\Hennc\113114\5-dsgn\50-WaterResources\CAD\WR figures\Prop figure.dgn
2-LAKE ST SEGMENT



I-35W PROJECT

EXISTING IMPERVIOUS BREAKDOWN OF GAP

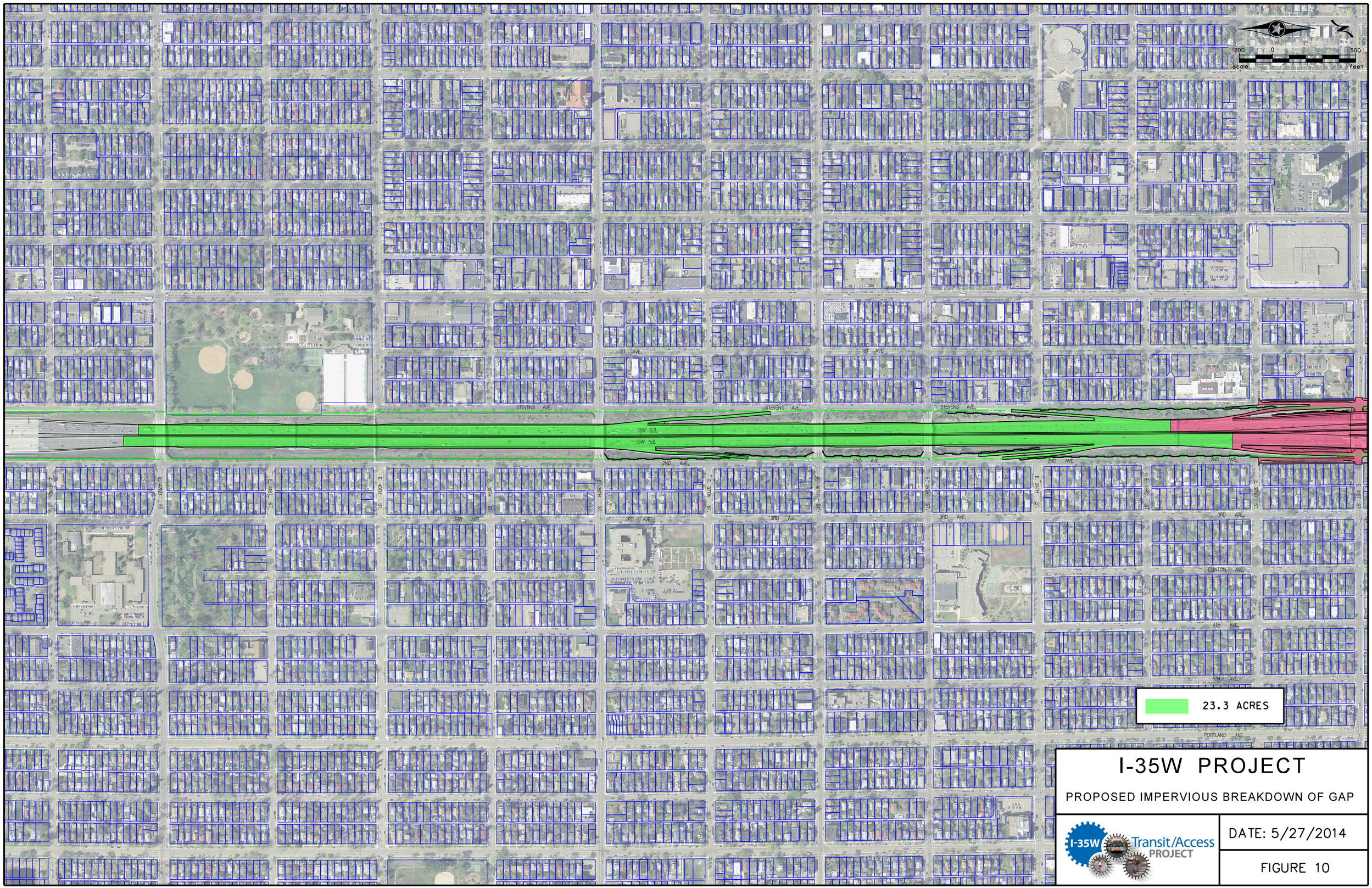
I-35W Transit/Access PROJECT

DATE: 5/27/2014

FIGURE 9

11:24:19 AM 5/27/2014 rbrooks

S:\FJVH\Henne\113114\5-dsgn\50-WaterResources\CAD\WR figures\Imp figure.dgn
1:SOUTH SEGMENT



I-35W PROJECT

PROPOSED IMPERVIOUS BREAKDOWN OF GAP

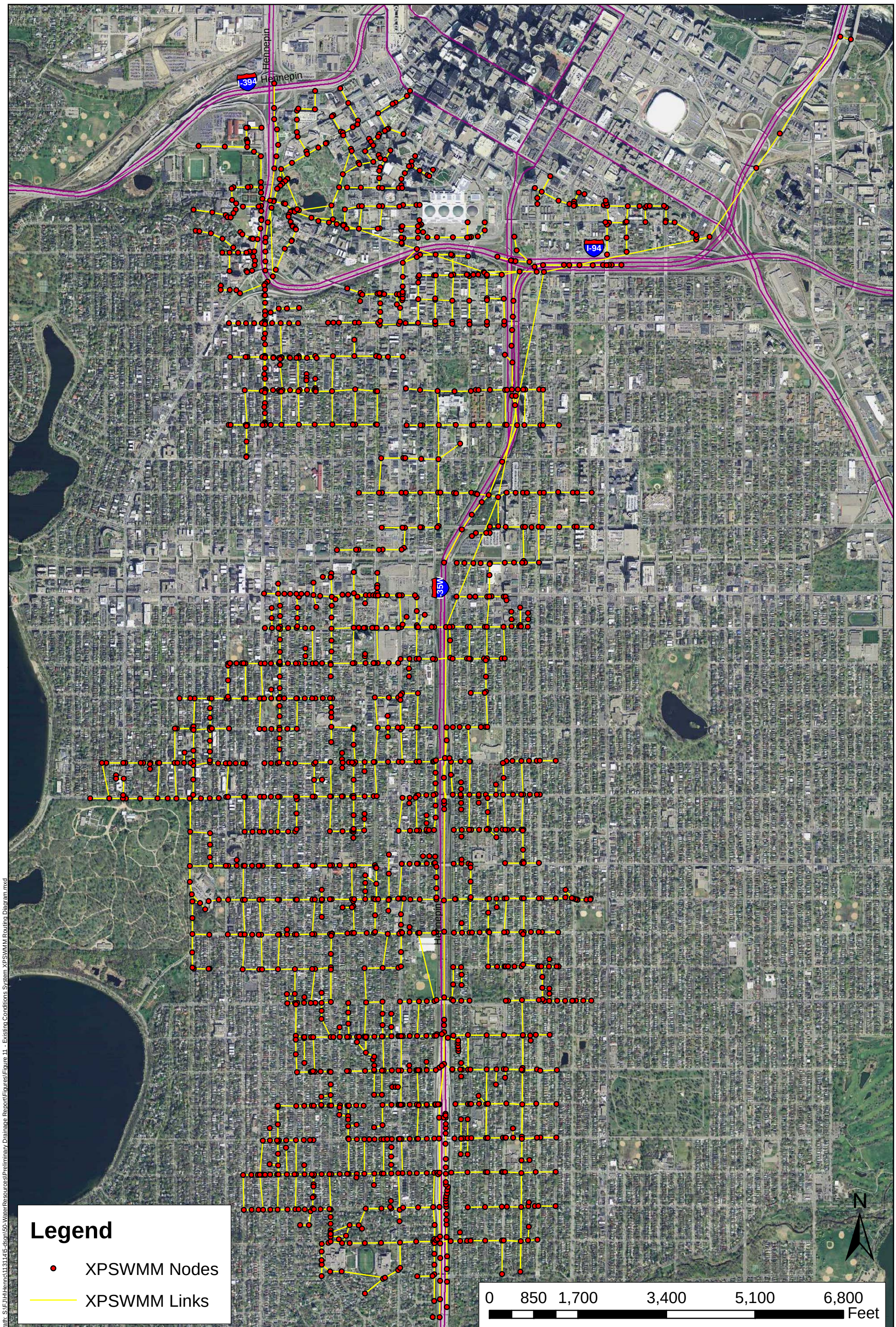
I-35W Transit/Access PROJECT

DATE: 5/27/2014

FIGURE 10

11:27:01 AM 5/27/2014 rbrooks

S:\FJVH\Henne\113114\5-dsgn\50-WaterResources\CAD\WR figures\Prop figure.dgn
1:SOUTH SEGMENT



Path: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Figures\Figure 11 - Existing Conditions System XPSWMM Routing Diagram.mxd

SEH

3535 VADNAIS CENTER DR.
ST. PAUL, MN 55110
PHONE: (651) 490-2000
FAX: (888) 908-8166
TF: (800) 325-2055
www.sehinc.com

Project: Hennc 113114
Print Date: 5/22/2014

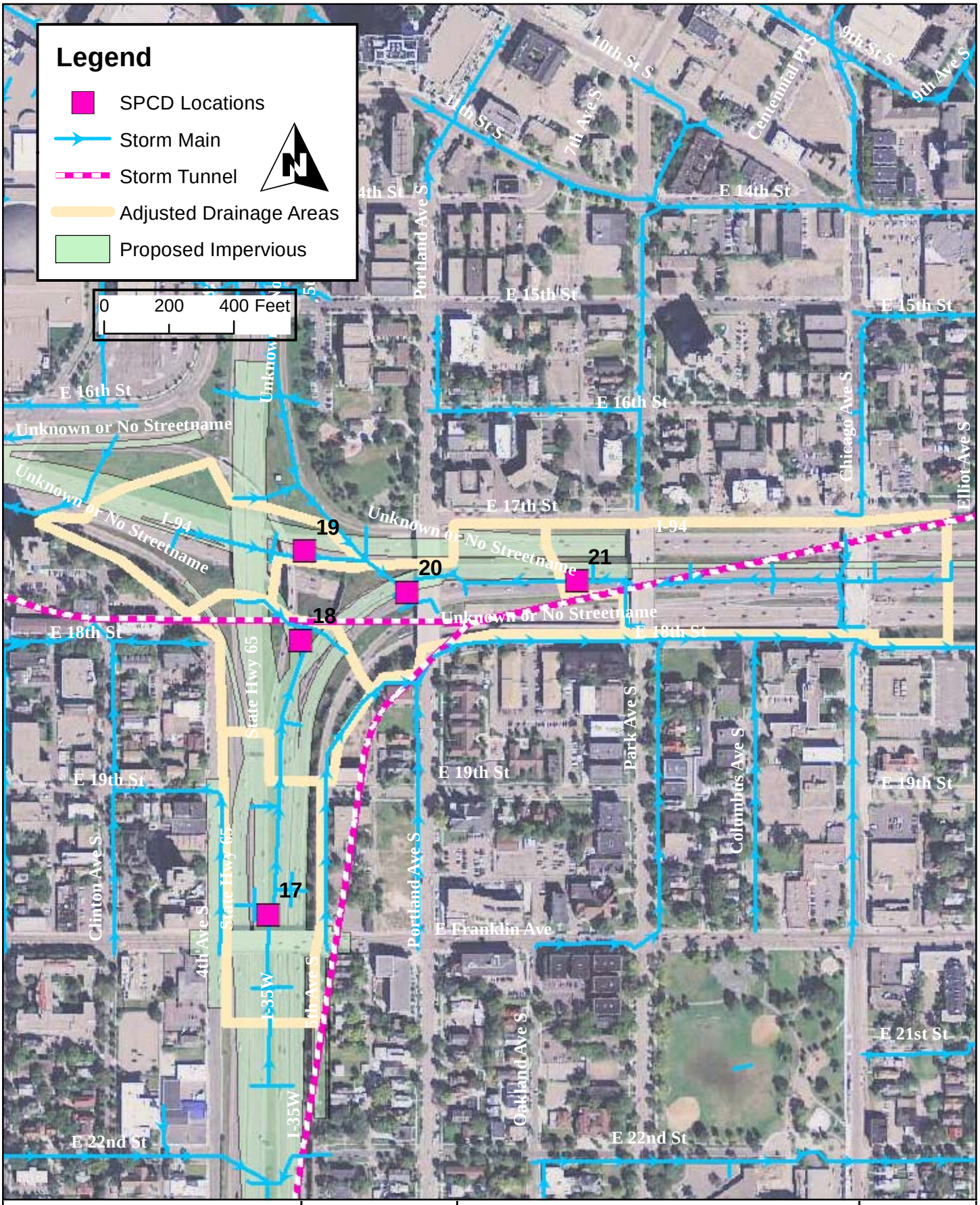
Map by: amh
Projection: Lambert Conformal Conic
Source: SEH Inc

Existing Conditions Model XPSWMM Routing Diagram

I-35W Transit Access
Hennepin County, Minnesota

Figure 11

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.



Path: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\StormwaterBMPs\SPCD_SHSAM\SPCD Locations_with Opt. 2_ELS.mxd

SEH

3535 VADNAIS CENTER DR.
ST. PAUL, MN 55110
PHONE: (651) 490-2000
FAX: (888) 908-8166
TF: (800) 325-2055
www.sehinc.com

Project: HENNC 113114
Print Date: 7/18/2014

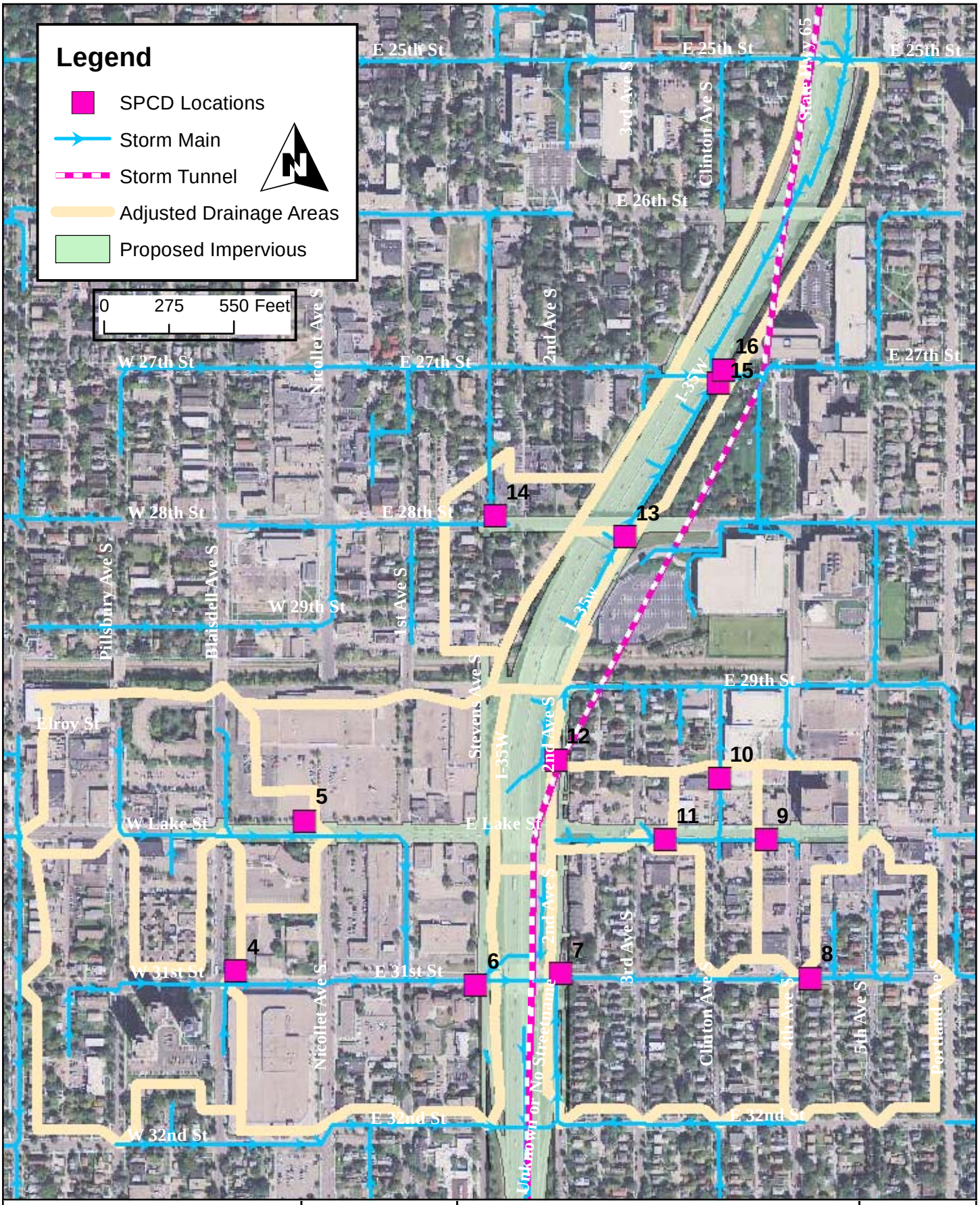
Map by: ELS
Projection:
Source:

94 Commons SPCD Locations

I-35W Corridor Drainage Study
Hennepin County, Minnesota

Figure 12

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.



Path: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\StormwaterBMPs\SPCD_SHSAM\SPCD Locations_with Opt. 2_ELS.mxd

SEH

3535 VADNAIS CENTER DR.
ST. PAUL, MN 55110
PHONE: (651) 490-2000
FAX: (888) 908-8166
TF: (800) 325-2055
www.sehinc.com

Project: HENNC 113114
Print Date: 7/18/2014

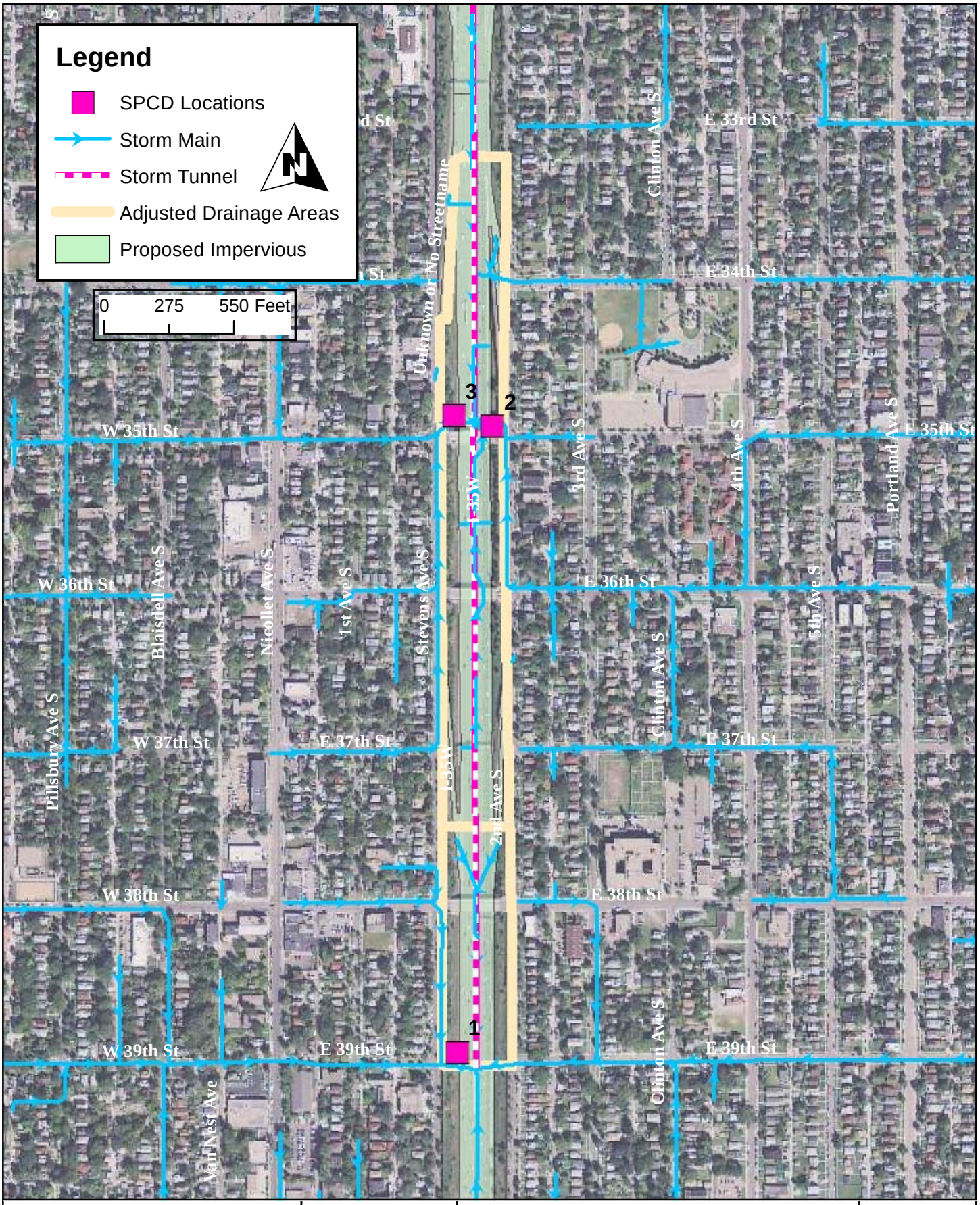
Map by: ELS
Projection:
Source:

Transit/Access SPCD Locations

I-35W Corridor Drainage Study
Hennepin County, Minnesota

Figure 13

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.



Path: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\StormwaterBMPs\SPCD_SHSAM\SPCD Locations_with Opt. 2_ELS.mxd

SEH

3535 VADNAIS CENTER DR.
ST. PAUL, MN 55110
PHONE: (651) 490-2000
FAX: (888) 908-8166
TF: (800) 325-2055
www.sehinc.com

Project: HENNC 113114
Print Date: 7/1/2014

Map by: ELS
Projection:
Source:

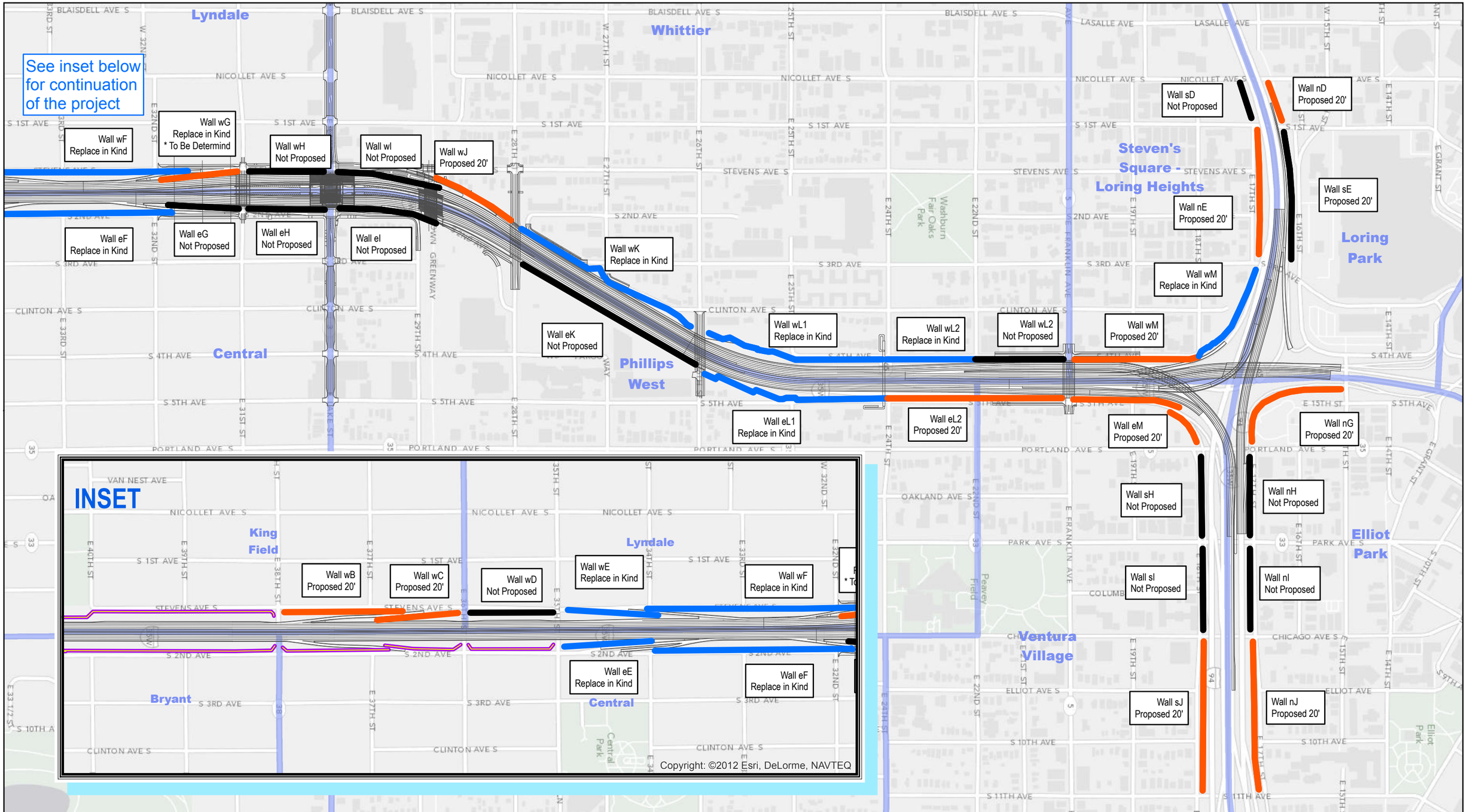
Gap SPCD Locations

I-35W Corridor Drainage Study
Hennepin County, Minnesota

Figure 14

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.

Path: P:\FJH\Hennc\113114\GIS\Noise_Receptors Blank2.mxd



SEH

0 0.075 0.15 Miles

Print Date: 10/30/2013

Map by: MSS
Projection: Hennepin County Coordinates
Source: Hennepin County, BING
City of Minneapolis, SEH

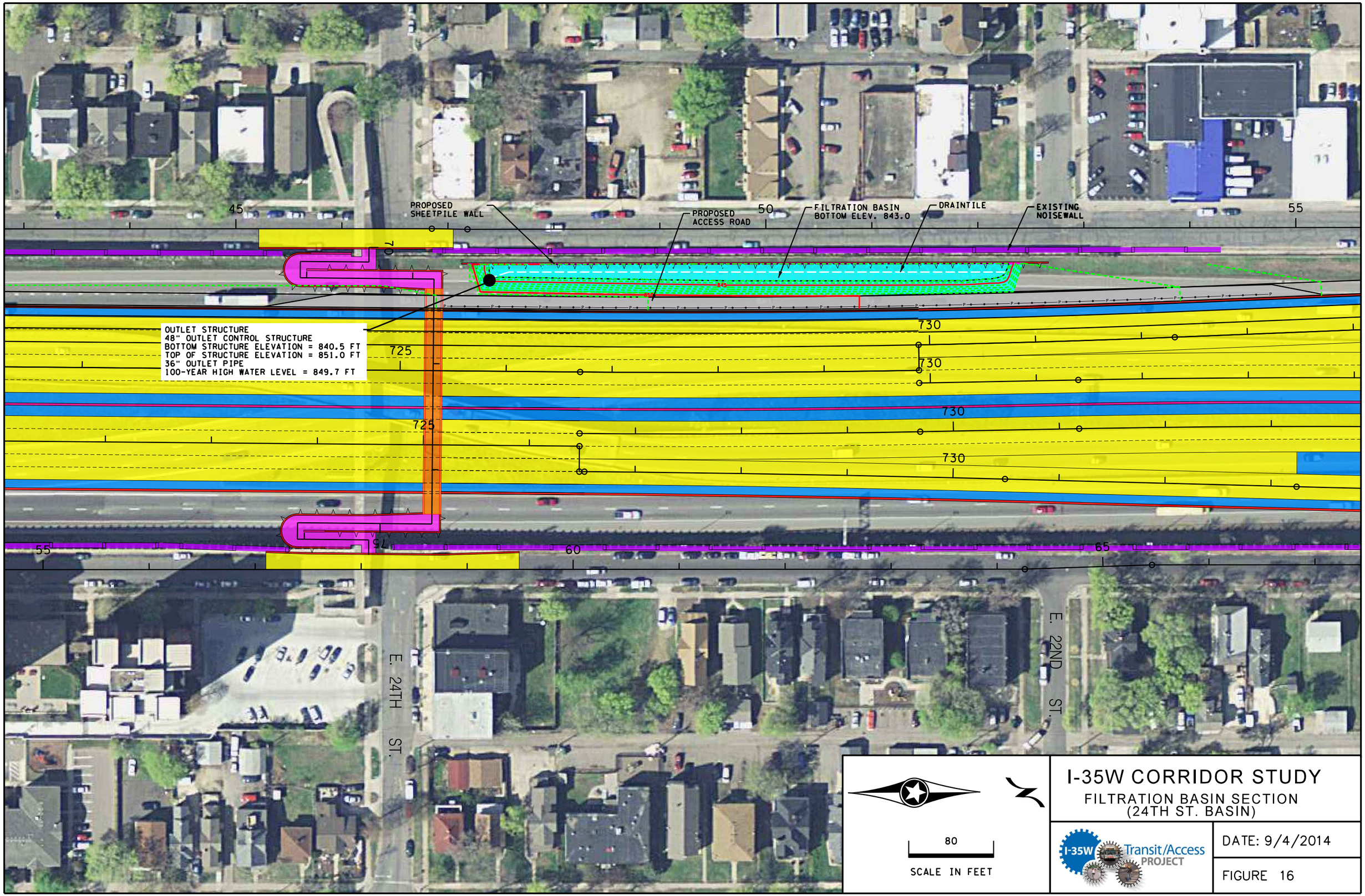
No Noise Wall Proposed
Replace In Kind
Proposed Noise Wall
Existing Noise Wall (UPA / Crosstown Project)
Proposed Geometrics

Preliminary Noise Wall Analysis

I-35W Transit Access Project
Minneapolis, MN

Figure 15

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.



I-35W CORRIDOR STUDY

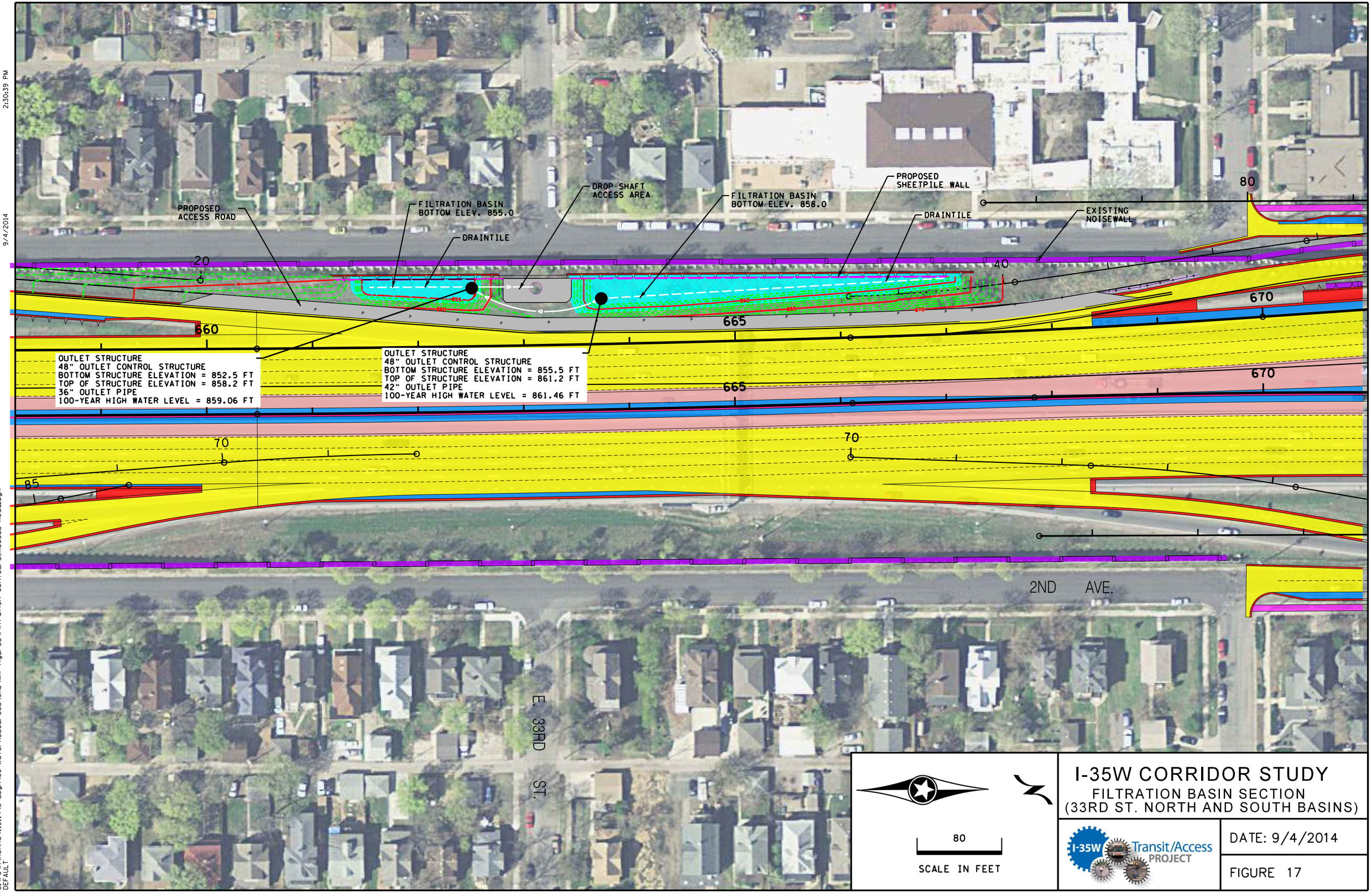
FILTRATION BASIN SECTION
(24TH ST. BASIN)

I-35W Transit/Access PROJECT

DATE: 9/4/2014

FIGURE 16

2:29:53 PM
9/4/2014
S:\FJN\Hennc\113114\5-dsgn\50-WaterResources\CAD\WR figures\Filtration Contours_Access Road.dgn
DEFAULT



I-35W CORRIDOR STUDY

FILTRATION BASIN SECTION (33RD ST. NORTH AND SOUTH BASINS)

I-35W Transit/Access PROJECT

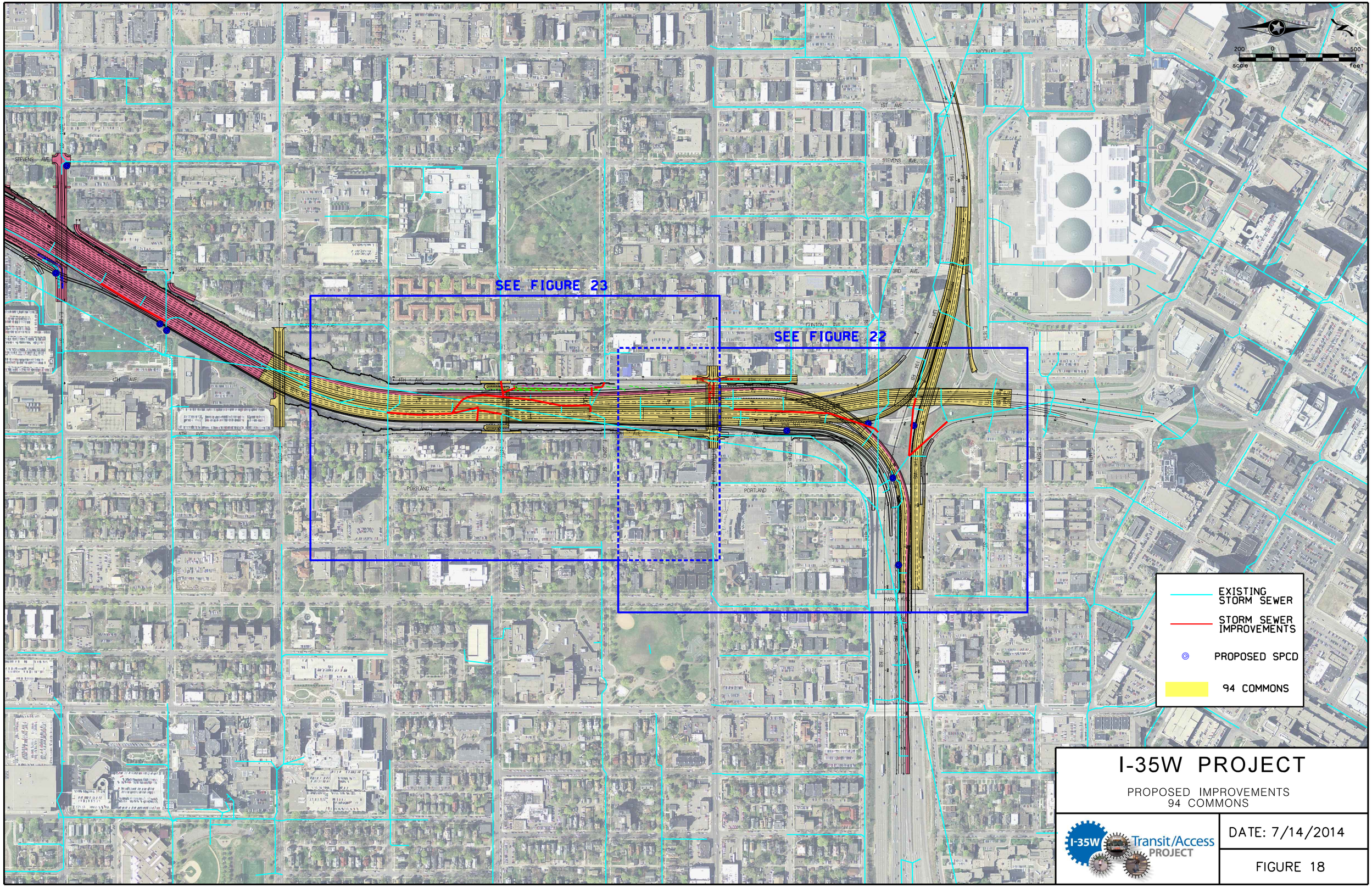
DATE: 9/4/2014

FIGURE 17

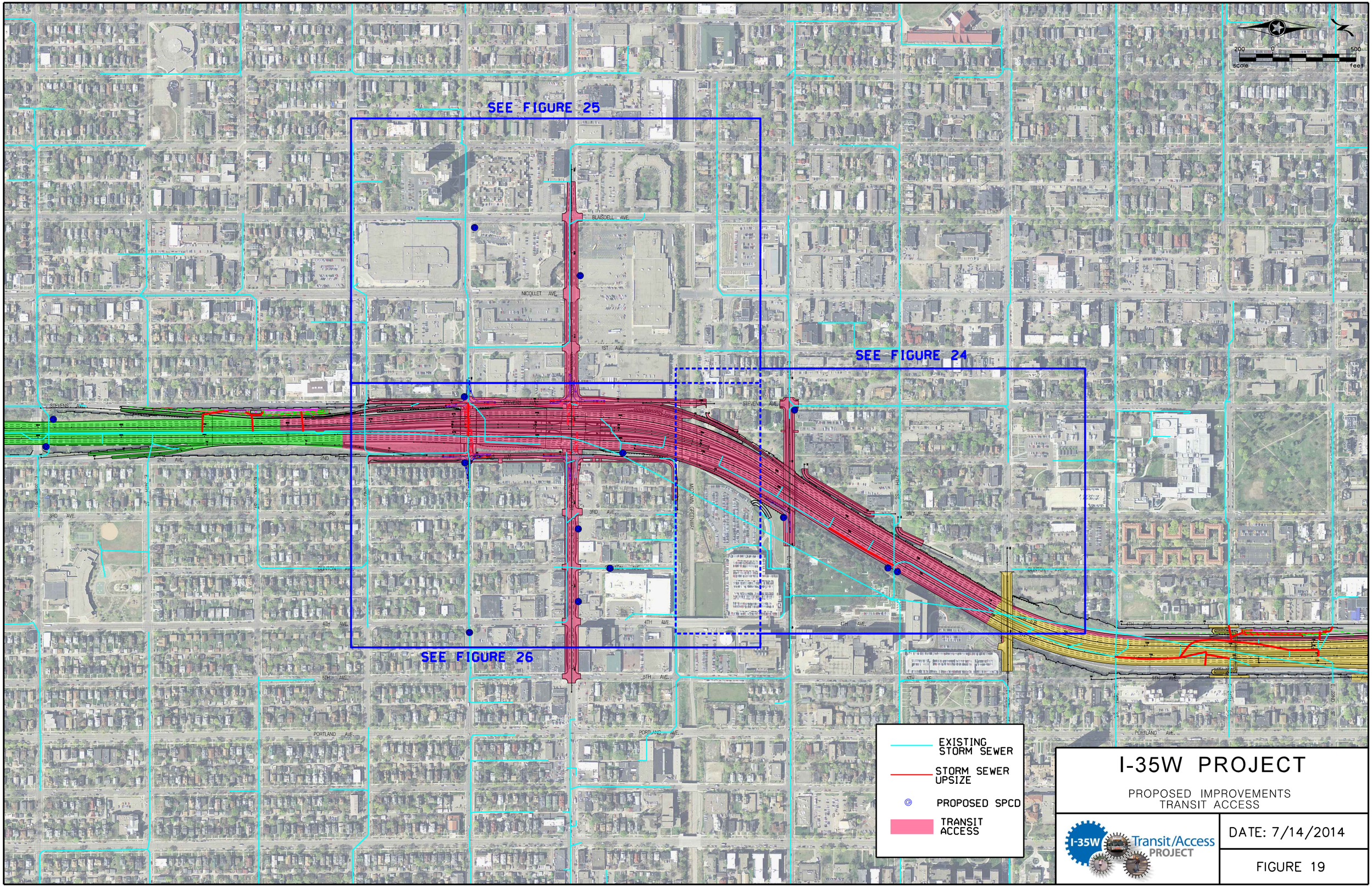
2:30:39 PM

9/4/2014

S:\FJN\Hennc\113114\5-dsgn\50-WaterResources\CAD\WR figures\Filtration Contours_Access Road.dgn
DEFAULT

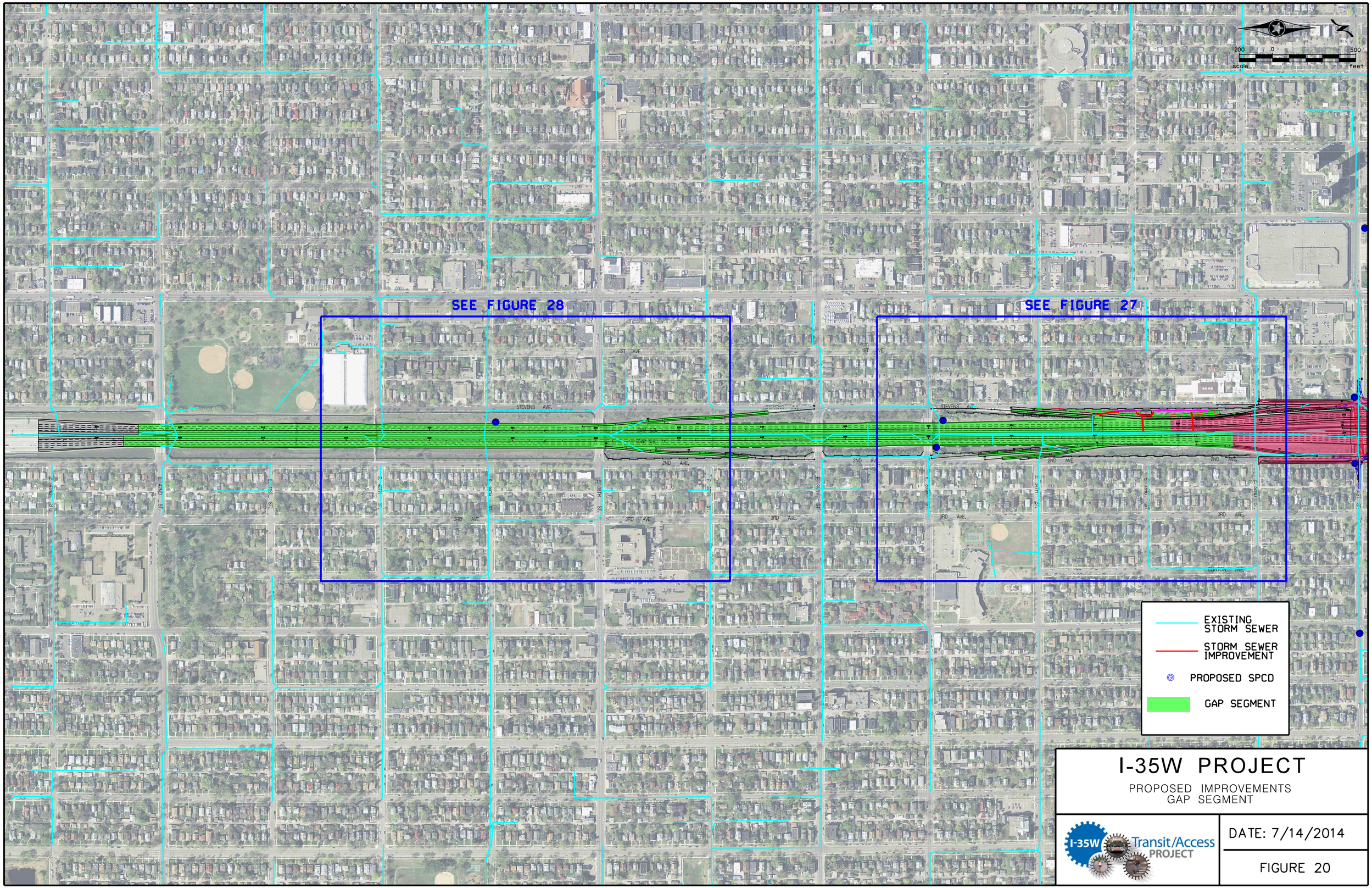


8:06:38 AM
7/14/2014
rbrooks
S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\CAD\WR figures\improvements.dgn
3.NORTH SEGMENT



8:05:47 AM 7/14/2014 rbrooks

S:\FJVH\Henne\113114\5-dsgn\50-WaterResources\CAD\WR figures\Improvements.dgn
2.LAKE ST SEGMENT



I-35W PROJECT

PROPOSED IMPROVEMENTS
GAP SEGMENT

I-35W Transit/Access PROJECT

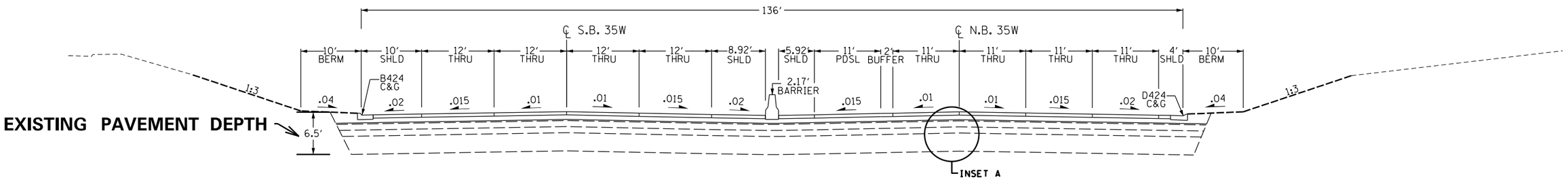
DATE: 7/14/2014

FIGURE 20

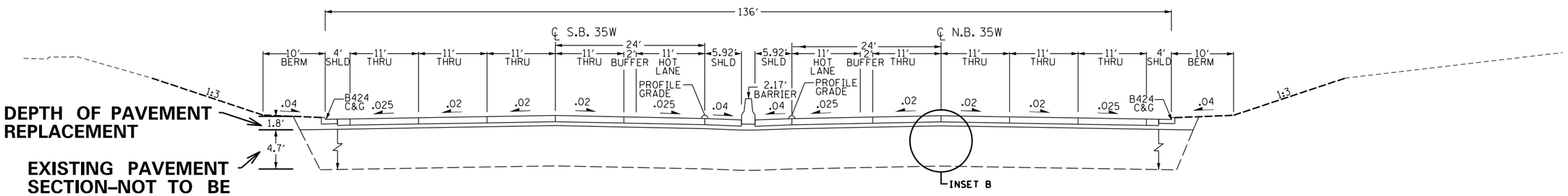
8:04:59 AM
7/14/2014
rbrooks
S:\FJN\Hennc\113114\5-dsgn\50-WaterResources\CADWR figures\improvements.dgn
1.SOUTH SEGMENT

PRELIMINARY

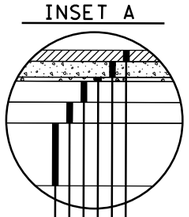
EXISTING TYPICAL SECTION FROM 43RD TO 36TH



PROPOSED TYPICAL SECTION FROM 43RD TO 36TH

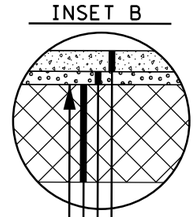


INSET A



- 6.5" BITUMINOUS OVERLAYS
- 9" REINFORCED CONCRETE PAVEMENT
- 2¼" AGGREGATE BASE CL 5
- 12" SELECT GRANULAR
- 12" SUBCUT WITH GRANULAR MATERIAL
- 36" SUBGRADE CORRECTION WITH GRANULAR MATERIAL

INSET B



- 11-13" CONCRETE PAVEMENT
- 6-9" AGGREGATE BASE CL 5
- EXISTING PAVEMENT SECTION
- LIMIT OF PROPOSED EXCAVATION

NOTES:

- THE EXISTING BITUMINOUS OVERLAYS AND REINFORCED CONCRETE PAVEMENT (APPROX. 16IN DEPTH) WILL BE REMOVED
- THE SECTION REMOVED WILL BE REPLACED WITH AN AGGREGATE LEVELING COURSE AND CONCRETE PAVEMENT
- THE ROADWAY WIDTH AND PROFILE WILL BE UNCHANGED

I-35W CORRIDOR STUDY

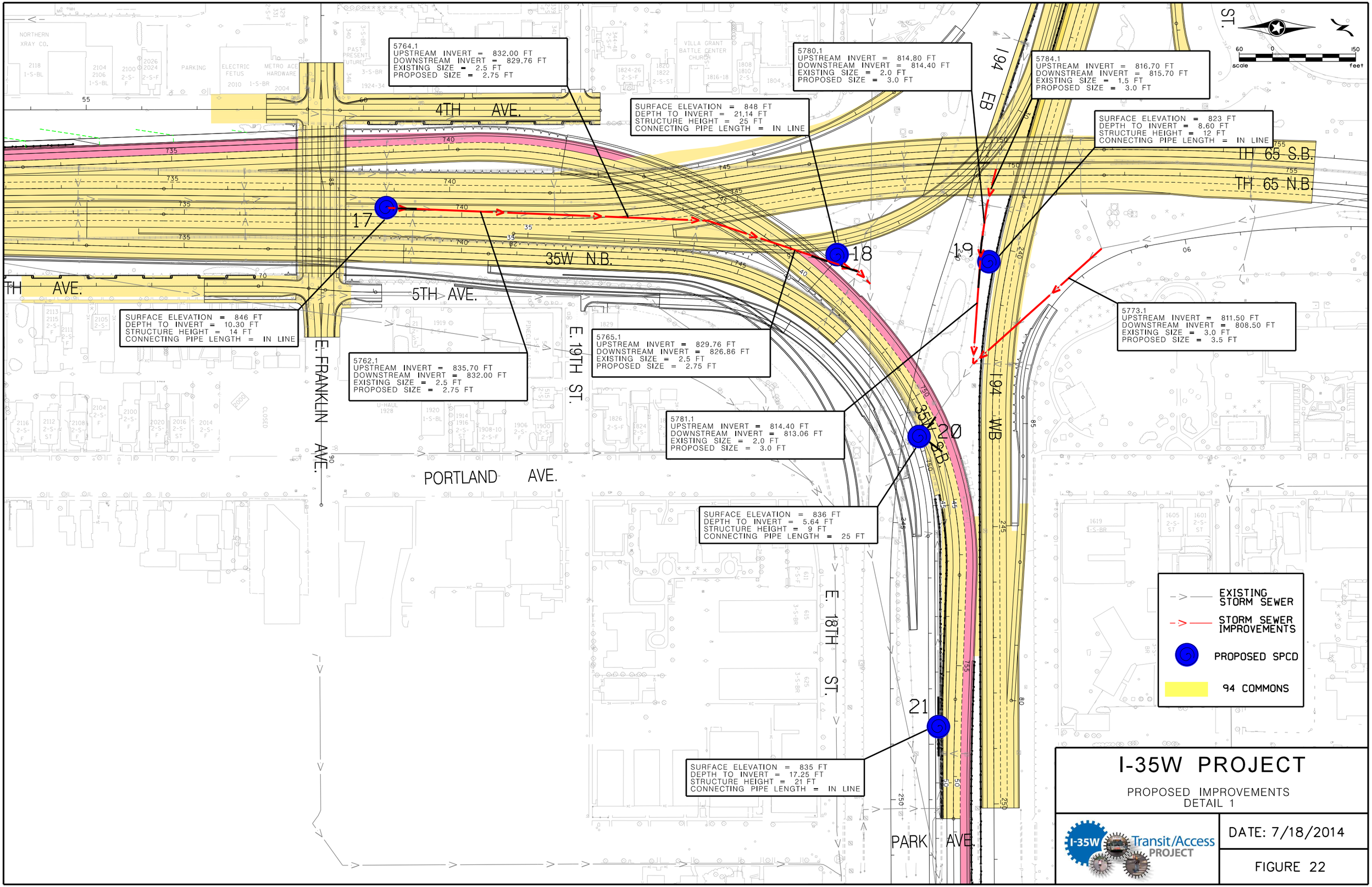
GAP SEGMENT TYPICAL SECTION

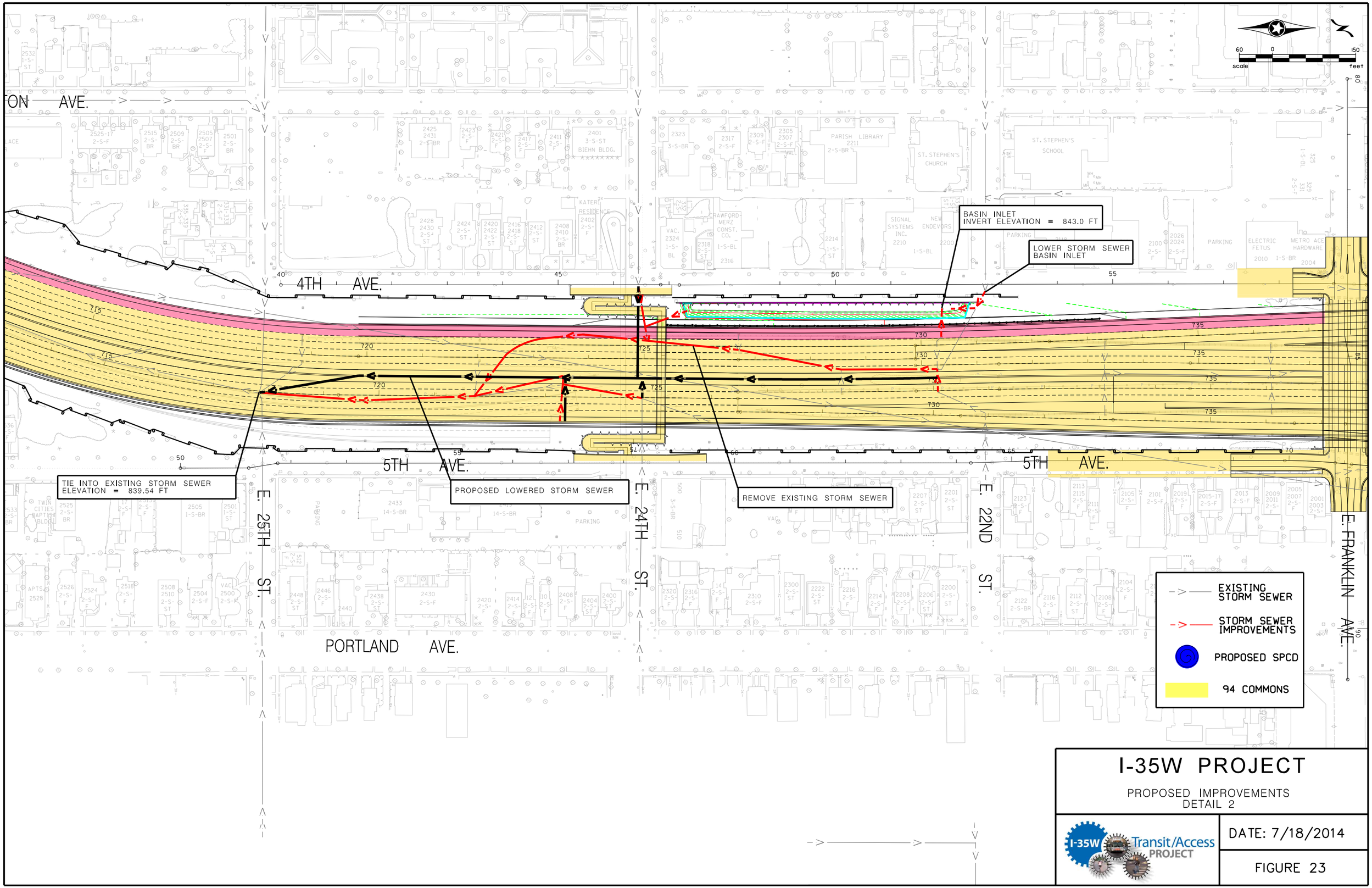
I-35W Transit/Access PROJECT

DATE: 7/14/2014

FIGURE 21

8:10:17 AM
7/14/2014
rbrooks
S:\FJN\Hennc\113114\5-dsgn\50-WaterResources\CAD\WR figures\TypicalSection figure.dgn
DEFAULT


5764.1
UPSTREAM INVERT = 832.00 FT
DOWNSTREAM INVERT = 829.76 FT
EXISTING SIZE = 2.5 FT
PROPOSED SIZE = 2.75 FT
5780.1
UPSTREAM INVERT = 814.80 FT
DOWNSTREAM INVERT = 814.40 FT
EXISTING SIZE = 2.0 FT
PROPOSED SIZE = 3.0 FT
5784.1
UPSTREAM INVERT = 816.70 FT
DOWNSTREAM INVERT = 815.70 FT
EXISTING SIZE = 1.5 FT
PROPOSED SIZE = 3.0 FT
SURFACE ELEVATION = 848 FT
DEPTH TO INVERT = 21.14 FT
STRUCTURE HEIGHT = 25 FT
CONNECTING PIPE LENGTH = IN LINE
SURFACE ELEVATION = 823 FT
DEPTH TO INVERT = 8.60 FT
STRUCTURE HEIGHT = 12 FT
CONNECTING PIPE LENGTH = IN LINE
SURFACE ELEVATION = 846 FT
DEPTH TO INVERT = 10.30 FT
STRUCTURE HEIGHT = 14 FT
CONNECTING PIPE LENGTH = IN LINE
5762.1
UPSTREAM INVERT = 835.70 FT
DOWNSTREAM INVERT = 832.00 FT
EXISTING SIZE = 2.5 FT
PROPOSED SIZE = 2.75 FT
5765.1
UPSTREAM INVERT = 829.76 FT
DOWNSTREAM INVERT = 826.86 FT
EXISTING SIZE = 2.5 FT
PROPOSED SIZE = 2.75 FT
5773.1
UPSTREAM INVERT = 811.50 FT
DOWNSTREAM INVERT = 808.50 FT
EXISTING SIZE = 3.0 FT
PROPOSED SIZE = 3.5 FT
5781.1
UPSTREAM INVERT = 814.40 FT
DOWNSTREAM INVERT = 813.06 FT
EXISTING SIZE = 2.0 FT
PROPOSED SIZE = 3.0 FT
SURFACE ELEVATION = 836 FT
DEPTH TO INVERT = 5.64 FT
STRUCTURE HEIGHT = 9 FT
CONNECTING PIPE LENGTH = 25 FT
SURFACE ELEVATION = 835 FT
DEPTH TO INVERT = 17.25 FT
STRUCTURE HEIGHT = 21 FT
CONNECTING PIPE LENGTH = IN LINE
17
18
19
20
21
4TH AVE.
5TH AVE.
PORTLAND AVE.
PARK AVE.
E. FRANKLIN AVE.
E. 19TH ST.
E. 18TH ST.
35W N.B.
35W S.B.
I-94 EB
I-94 WB
IH 65 S.B.
IH 65 N.B.
EXISTING STORM SEWER
STORM SEWER IMPROVEMENTS
PROPOSED SPCD
94 COMMONS
I-35W PROJECT
PROPOSED IMPROVEMENTS
DETAIL 1
I-35W Transit/Access PROJECT
DATE: 7/18/2014
FIGURE 22
10:40:51 AM
7/18/2014
rbrooks
S:\FJX\Henne\113114\5-dsgn\50-WaterResources\CAD\WR figures\Improvements_details.dgn
22



I-35W PROJECT

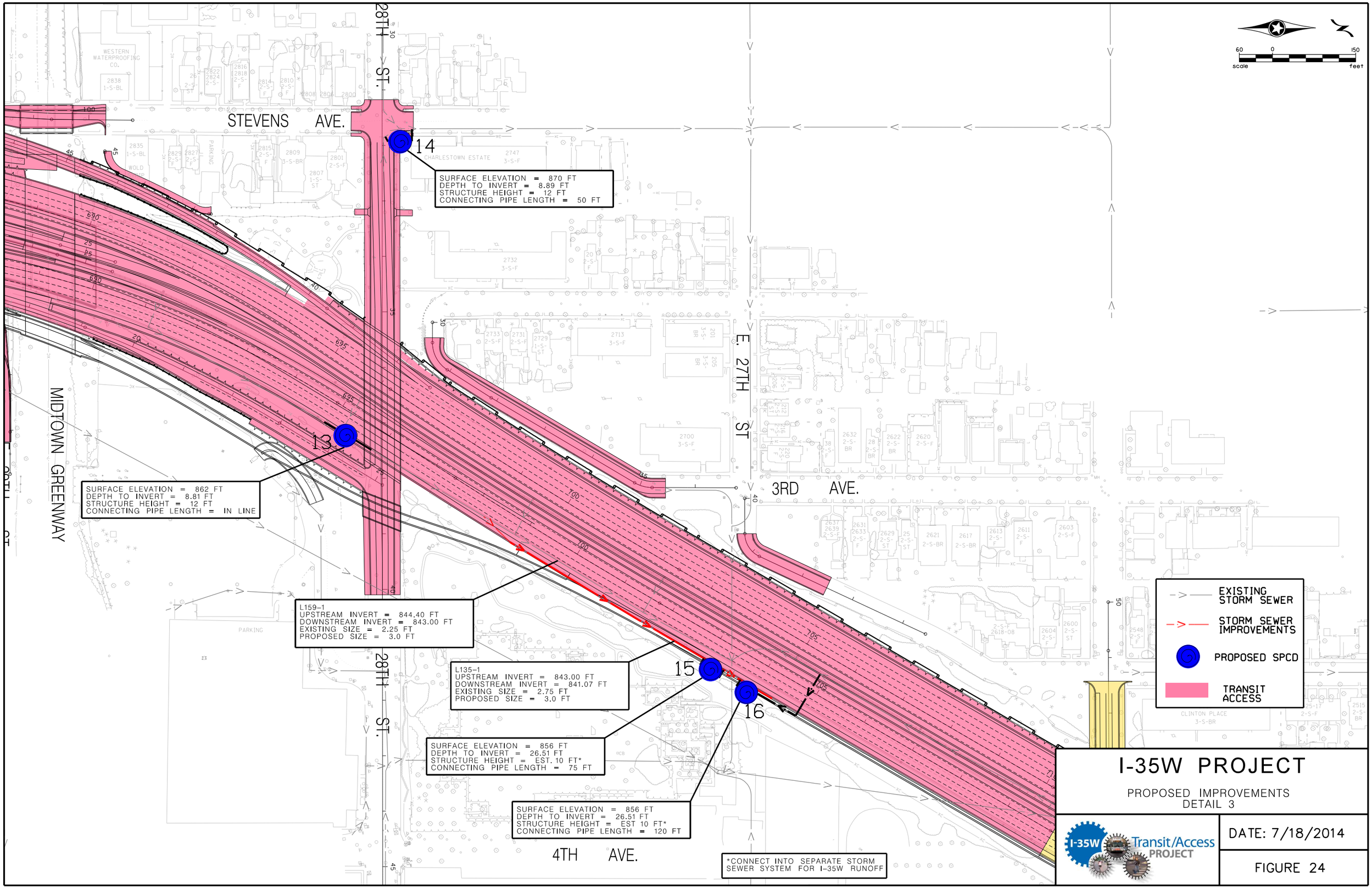
PROPOSED IMPROVEMENTS
DETAIL 2

I-35W Transit/Access PROJECT

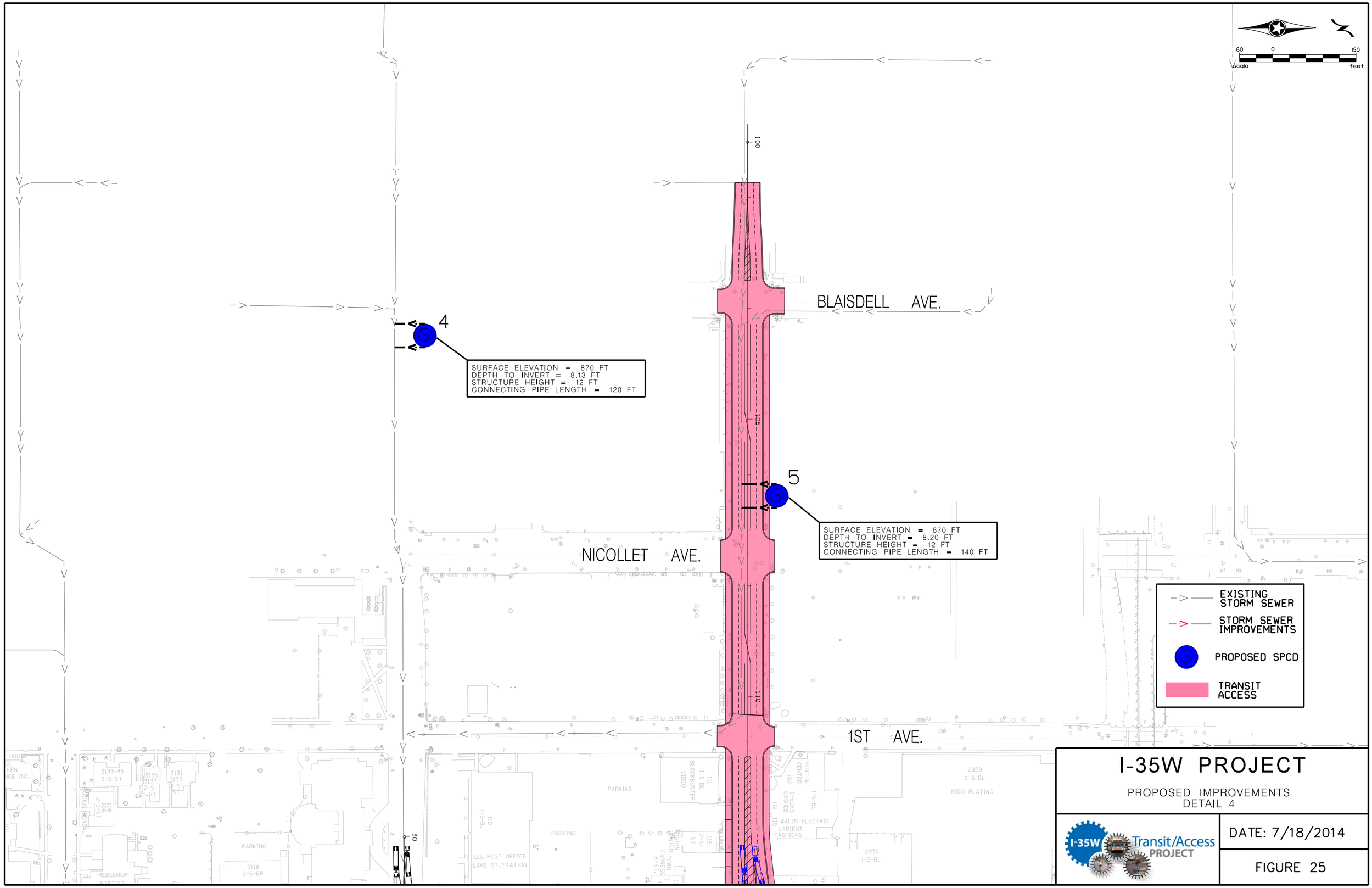
DATE: 7/18/2014

FIGURE 23

10:41:15 AM
7/18/2014
rbrooks
S:\F_J\H\Henne\113114\5-dsgn\50-WaterResources\CAD\WR figures\improvements_details.dgn
23

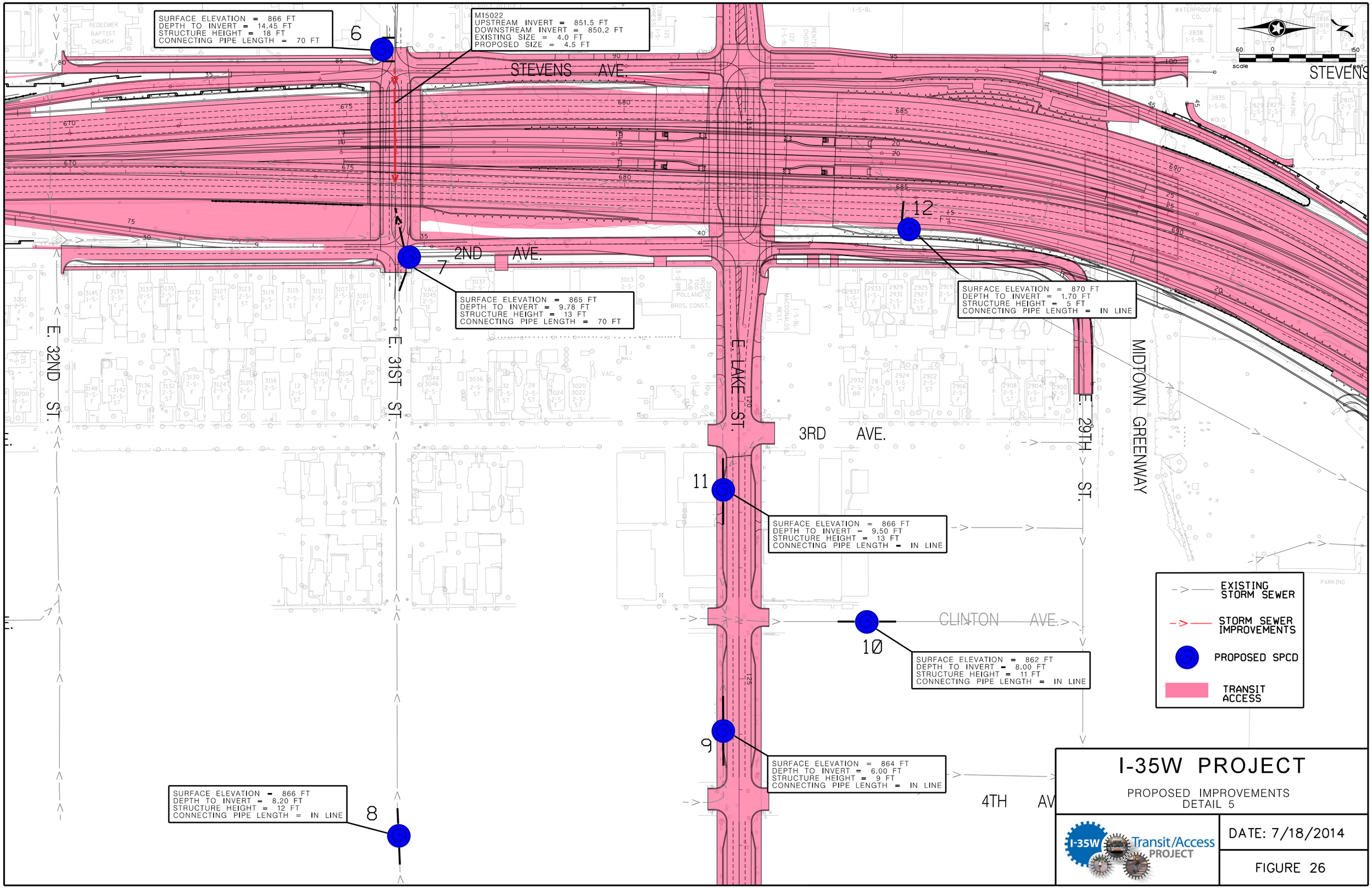


10:41:36 AM
7/18/2014
rbrooks
S:\FJVH\Hennc\113114\5-dsgn\50-WaterResources\CAD\WR figures\improvements_details.dgn
24



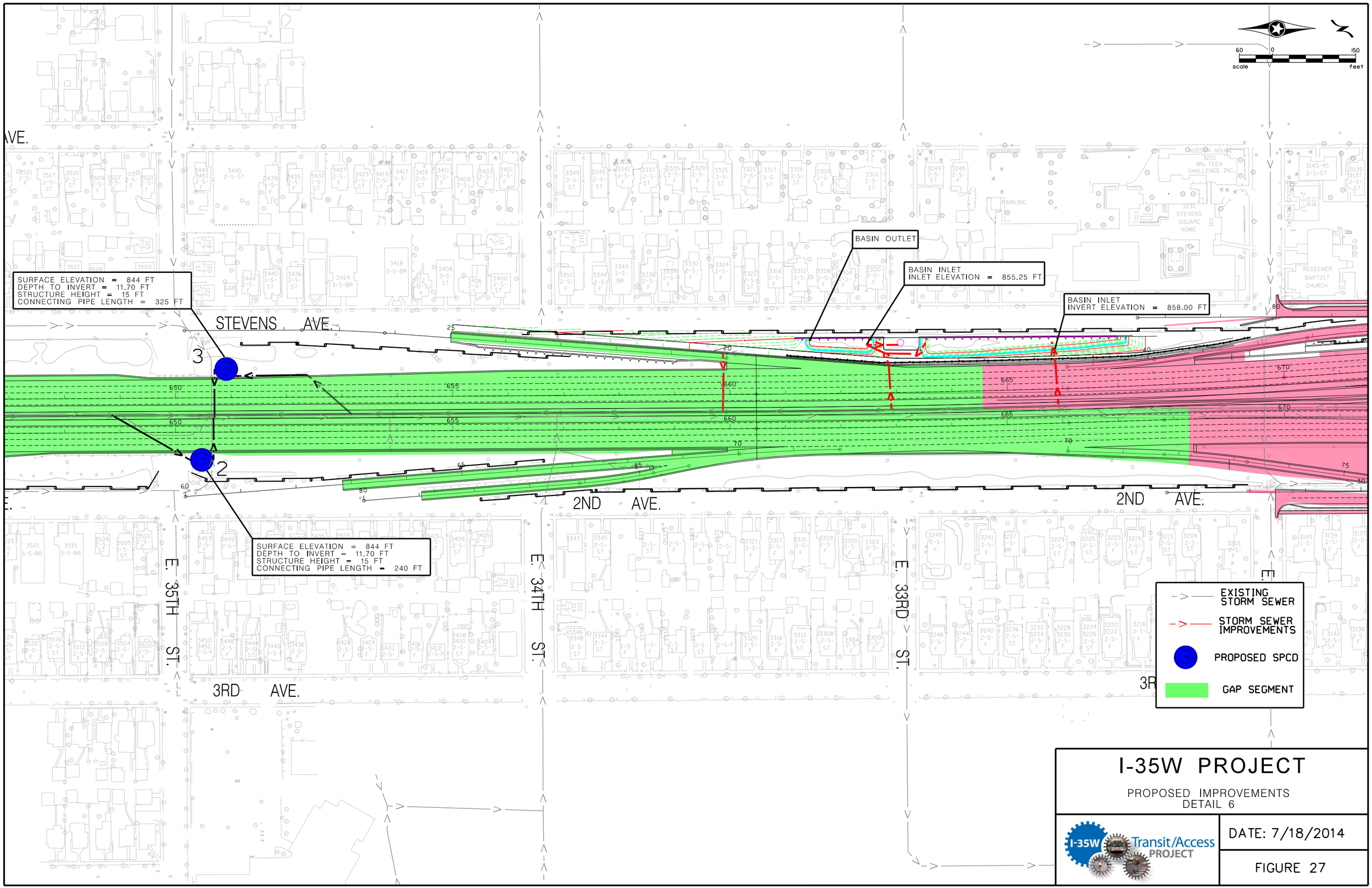
10:41:57 AM 7/18/2014 rbrooks

S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\CAD\WR figures\improvements_details.dgn
25



11:05:31 AM 7/18/2014 rbrooks

S:\FJN\Hennc\113114\5-dsgn\50-WaterResources\CAD\WR figures\improvements_details.dgn
26



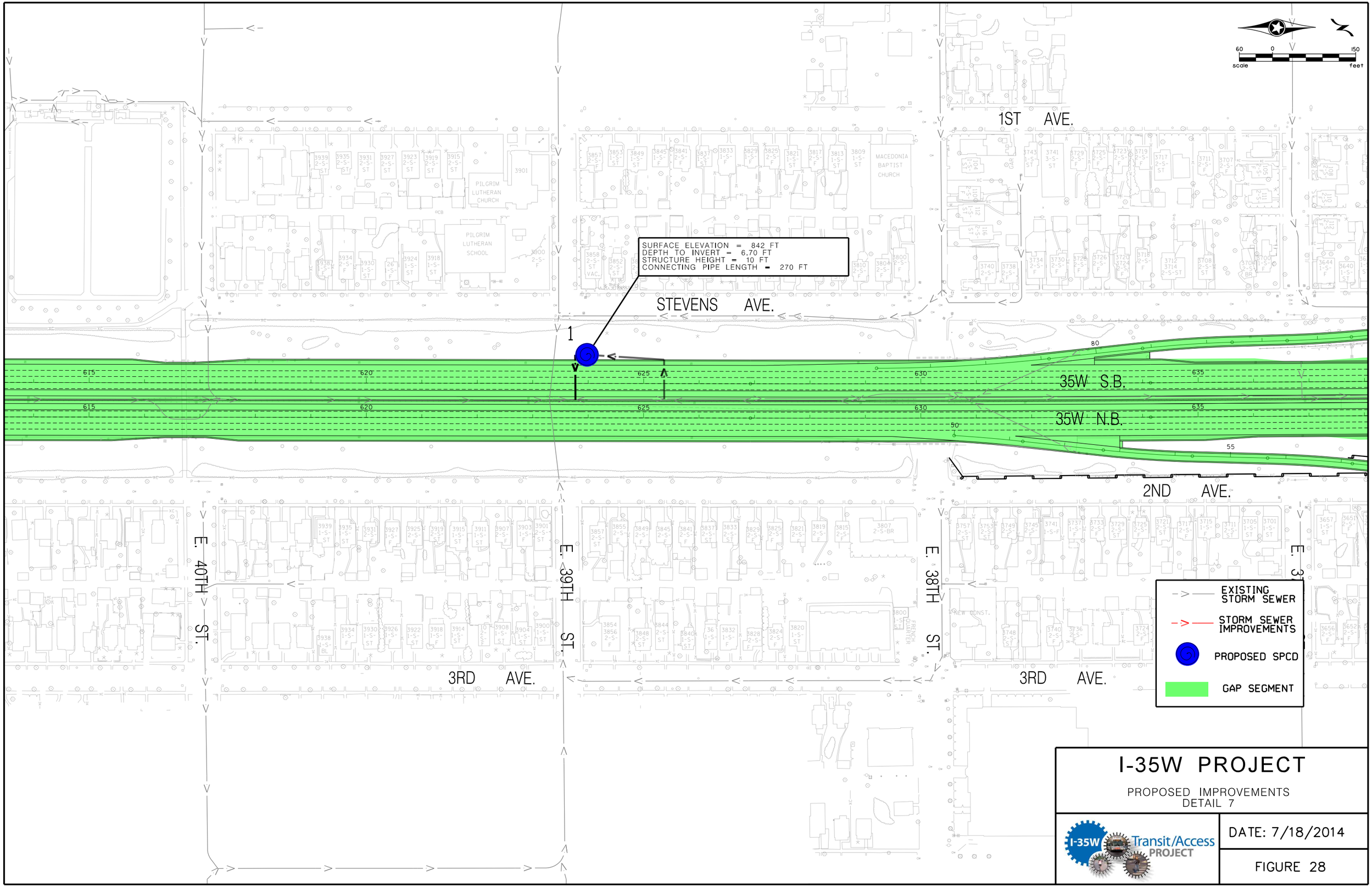
I-35W PROJECT

PROPOSED IMPROVEMENTS
DETAIL 6

DATE: 7/18/2014

FIGURE 27

S:\FJVH\Hennc\113114\5-dsgn\50-WaterResources\CAD\WR figures\improvements_details.dgn
7/18/2014 11:02:41 AM
rbrooks
27



I-35W PROJECT

PROPOSED IMPROVEMENTS
DETAIL 7

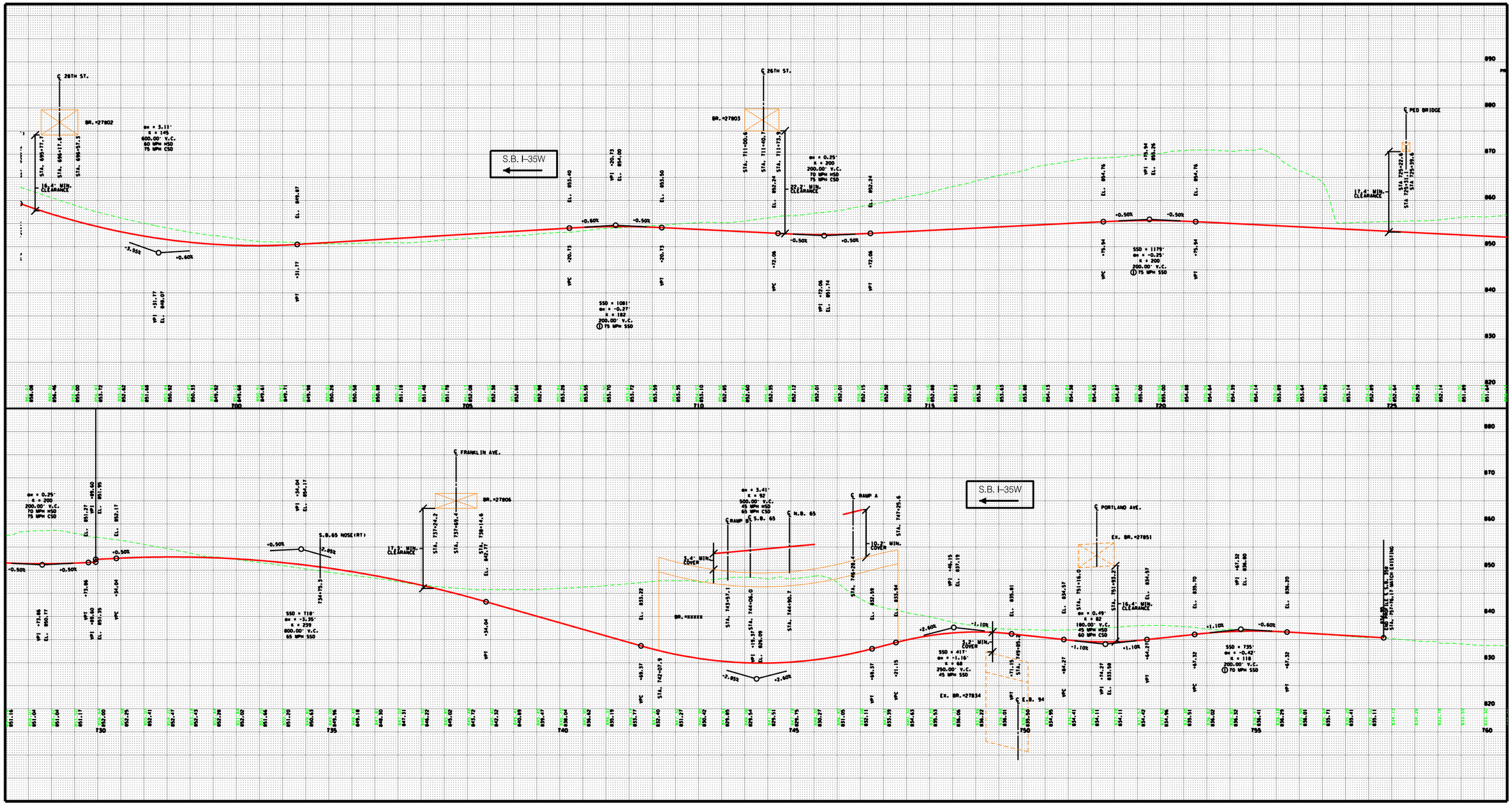
I-35W Transit/Access PROJECT

DATE: 7/18/2014

FIGURE 28

10:42:58 AM 7/18/2014 rbrooks

S:\FJVH\Hennc\113114\5-dsgn\50-WaterResources\CADWR figures\improvements_details.dgn
28



I-35W PROJECT

94 COMMONS
PROFILE

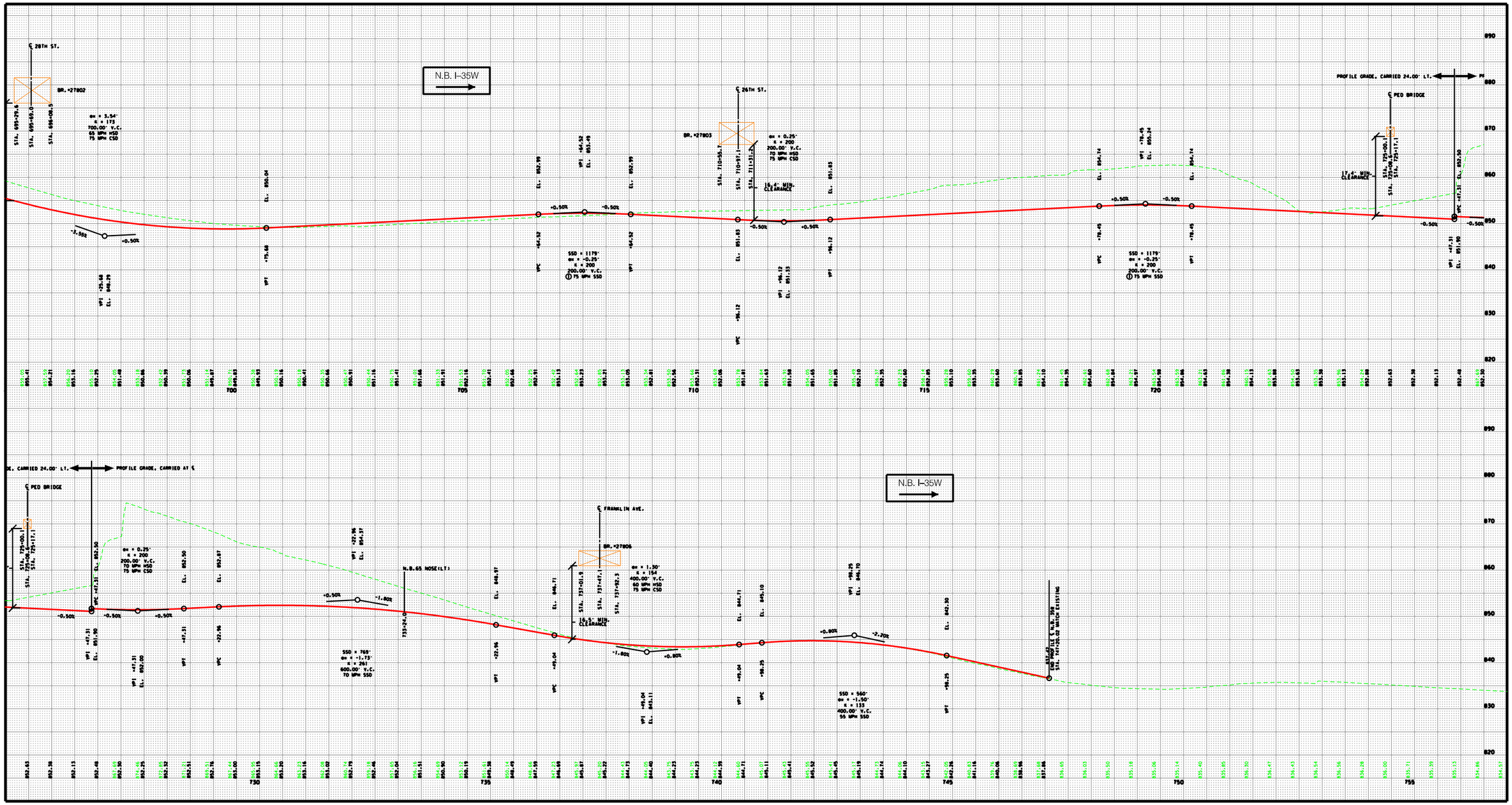
I-35W Transit/Access PROJECT

DATE: 7/11/2014

FIGURE 29

8:16:22 AM 7/11/2014 rbrooks

S:\FJH\Hennc\113114\5-dsgn\50-WaterResources\CAD\WR figures\hennc113114_pr_lol.dgn
Default



I-35W PROJECT

94 COMMONS
PROFILE

I-35W Transit/Access PROJECT

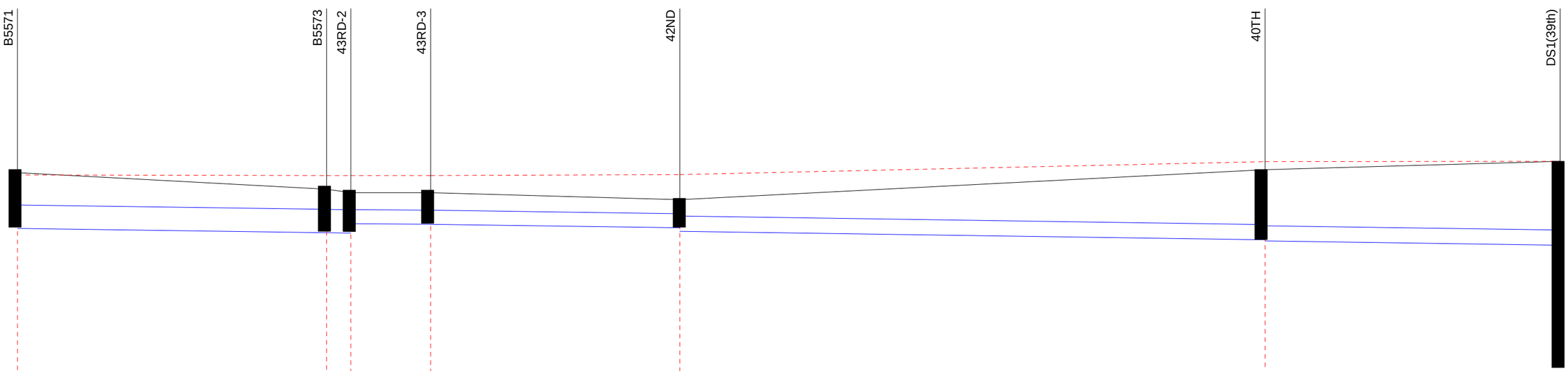
DATE: 7/11/2014

FIGURE 30

8:15:48 AM 7/11/2014 rbrooks

S:\F_J\H\Hennc\113114\5-dsgn\50-WaterResources\CAD\WR figures\hennc113114_pr_lo1.dgn
Default

Figure 31
Existing Conditions Hydraulic Grade Line
Model: 2014 Existing Conditions Atlas 14



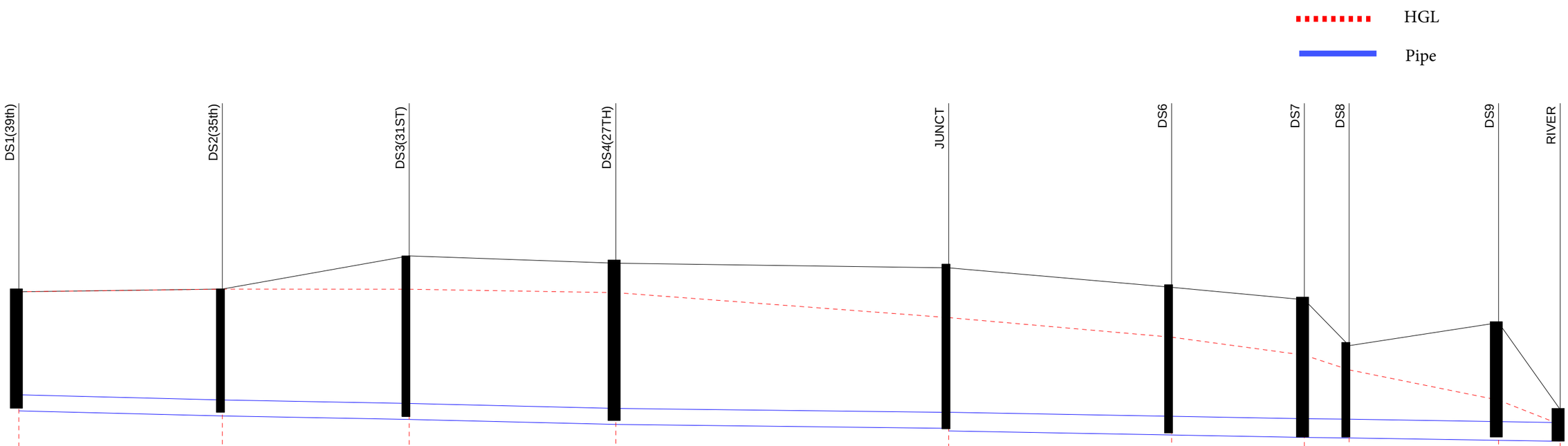
Velocity, ft/s	4.299	-5.496	9.517	11.130	12.826	15.502
Pipe Diameter, ft	10.00000	10.00000	6.00000	6.00000	6.50000	6.50000

Datum RL 680.000

HGL	832.74	832.48	832.48	832.48	832.48	832.48	832.86	832.86	838.40	838.40	838.60
Invert Elevations	809.91	808.09	808.06	807.92	811.93	811.69	811.68	810.18	808.68	805.05	804.55	802.72
RIM Elevations	833.730	826.680	825.170	825.170	822.160	835.000	838.600

05-Sep-2014
Existing Conditions 100 Year

Figure 32
Existing Conditions Hydraulic Grade Line
Model: 2014 Existing Conditions Atlas 14



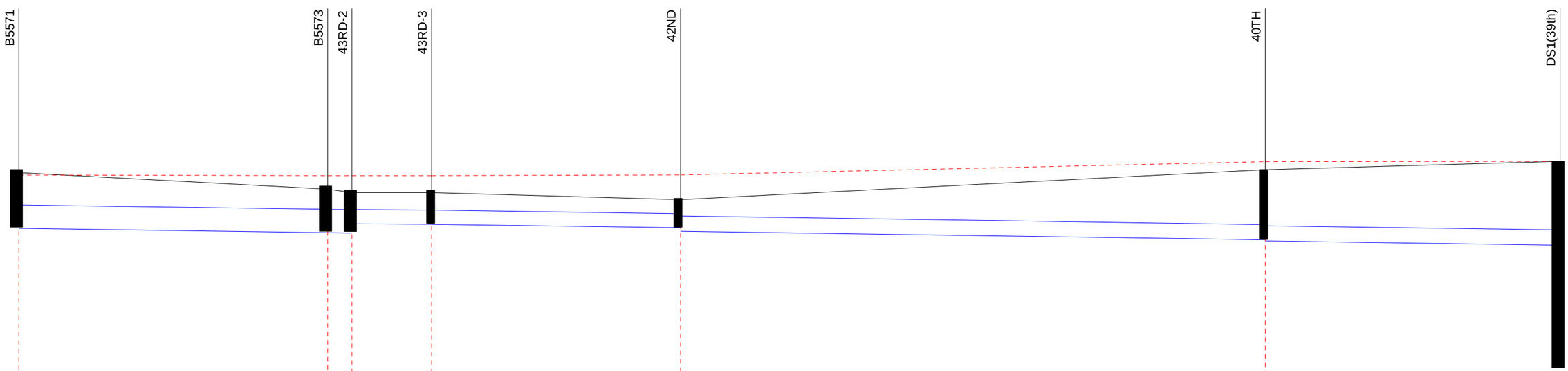
	DS1(39th)	DS2(35th)	DS3(31ST)	DS4(27TH)	JUNCT	DS6	DS7	DS8	DS9	RIVER
Velocity, ft/s	7.424	9.524	10.894	14.932	17.280	19.155	22.001	22.114	22.435	
Pipe Diameter, ft	12.00000	12.00000	12.00000	12.00000	14.00000	14.00000	14.00000	14.00000	14.00000	

Datum RL 588.000

HGL	838.60	840.55	840.55	840.49	840.49	837.92	837.92	819.30	819.30	804.62	804.62	791.17	791.17	780.20	780.20	757.57	757.57	739.38
Invert Elevations	749.54	745.74	745.74	743.10	743.10	739.40	739.40	736.43	734.49	731.50	731.50	729.70	729.70	729.30	729.30	727.50	727.50	726.80
RIM Elevations	838.600	840.600		865.500		860.000		856.500		841.900		832.700		798.300		815.500		750.500

05-Sep-2014
Existing Conditions

Figure 33
Proposed Conditions Hydraulic Grade Line
Model: Proposed Conditions with Rate Control Structures



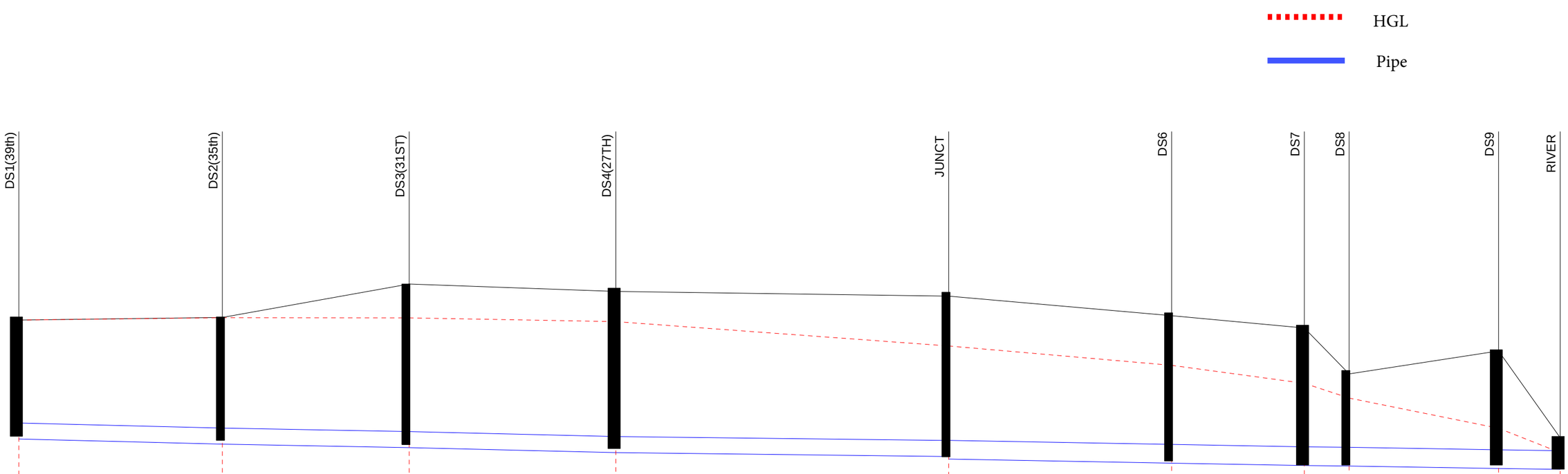
Velocity, ft/s	4.262	-5.483	9.477	11.101	12.810	15.543	
Pipe Diameter, ft	10.00000	10.00000	6.00000	6.00000	6.50000	6.50000	

Datum RL 680.000

HGL	832.71	832.45	832.45	832.45	832.45	832.45	832.72	832.72	838.40	838.40	838.60
Invert Elevations	809.91	808.09	808.06	807.92	811.93	811.69	811.68	810.18	808.68	805.05	804.55	802.72
RIM Elevations	833.730	826.680	825.170	825.170	822.160	835.000	838.600

05-Sep-2014
Proposed 100 Year

Figure 34
Proposed Conditions Hydraulic Grade Line
Model: Proposed Conditions with Rate Control Structures

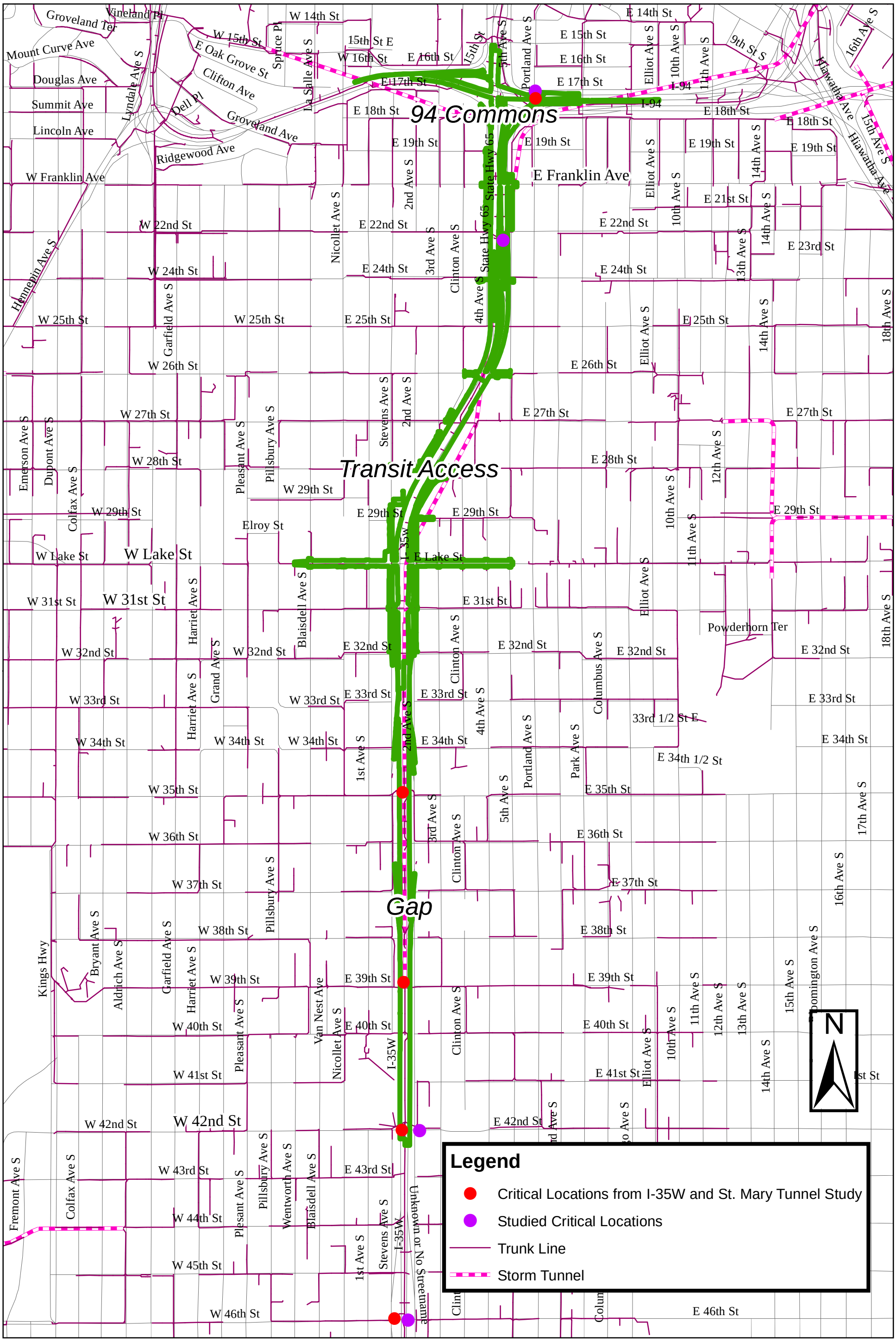


	DS1(39th)	DS2(35th)	DS3(31ST)	DS4(27TH)	JUNCT	DS6	DS7	DS8	DS9	RIVER
Velocity, ft/s	7.575	9.698	11.116	14.714	17.234	19.117	22.010	22.123	22.446	
Pipe Diameter, ft	12.00000	12.00000	12.00000	12.00000	14.00000	14.00000	14.00000	14.00000	14.00000	

Datum RL 588.000

HGL	838.60	840.41	840.41	840.24	840.24	837.46	837.46	819.18	819.18	804.66	804.66	791.21	791.21	780.23	780.23	757.58	757.58	739.39
Invert Elevations	749.54	745.74	745.74	743.10	743.10	739.40	739.40	736.43	734.49	731.50	731.50	729.70	729.70	729.30	729.30	727.50	727.50	726.80
RIM Elevations	838.600	840.600		865.650		860.000		856.500		841.900		832.700		798.300		815.500		750.500

05-Sep-2014
Proposed 100 Year



SEH
3535 VADNAIS CENTER DR.
ST. PAUL, MN 55110
PHONE: (651) 490-2000
FAX: (888) 908-8166
TF: (800) 325-2055
www.sehinc.com

Project: Hennc 113114
Print Date: 9/10/2014

Map by: els
Projection: Lambert Conformal Conic
Source: SEH Inc

Critical Points

I-35W Transit Access
Hennepin County, Minnesota

Figure 35

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.

Path: S:\FJH\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Figures\Figure 35 - Critical Locations.mxd

This Page Left Blank Intentionally

Appendix B

Analysis Calculations and Detailed Results

Table B1 – XP-SWMM Existing Conditions Model Updates
Table B2 – XP-SWMM Existing Conditions Hydrologic Input Parameters
Table B3 – XP-SWMM Proposed Conditions Hydrologic Input Parameters
Table B4 – XP-SWMM Existing Conditions Hydraulic Input Parameters
Table B5 – XP-SWMM Proposed Conditions Hydraulic Input Parameters
Table B6 – XP-SWMM Node Results
Table B7 – XP-SWMM Link Results
Table B8 – SPCD Sensitivity Analysis
Table B9 – Particle Curve Analysis
Table B10 – Adjusted Drainage Basins
Table B11 – Water Quality Treatment Breakdown
Table B12 – SAFL Baffle® Treatment Analysis
Table B13 – Stormceptor® Treatment Analysis
Table B14 – Stormwater BMP Master List
Table B15 – Preliminary Basin Sizing

This Page Left Blank Intentionally

Table B1 - XPSWMM Existing Conditions Model Updates
I-35W Corridor Drainage Study
HENNC 113114
Date: 5.14.14
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Tables

This table represents changes that were made to the City of Minneapolis Existing Conditions model to create the SEH Existing Conditions Model, additional minor changes were made to names

Drainage Area Updates												
Minneapolis Model Drainage Area						SEH Revised Drainage Area						
Node Name	GIS Name	Area (ac)	Imp(%)	Total Imp Area (ac)	Slope	Name	XPSWMM Node Name	Area (ac)	Imp(%)	Total Imp Area (ac)	Width (ft)	Slope
42nd	42nd	29.14	61.7	18.0	0.009	42nd A	DS1 (39th)	6.85	61%	4.20	181	0.008
						42nd B	40th	4.5	53%	2.40	157	0.009
						42nd D	B5573	4.77	78%	3.70	230	0.019
Total		29.14						29.14		18.00		
35th	35th	30.48	61.7	18.8	0.013	35th A	DS3(31ST)	6	58%	3.50	170	0.005
						35th B	DS2 (35th)	13.51	67%	9.02	195	0.019
						35th C	216-0	8.73	54%	4.70	149	0.019
						35th D	215-0	2.26	71%	1.60	204	0.019
Total		30.48						30.5		18.82		
24th/25th-35W	24th/25th-35W	11.04	65.4	7.2	0.01	24/25-35W A	N166	3.48	75%	2.60	100	0.005
						24/25-35W B	24/25-35W	4.88	51%	2.50	116	0.005
DS15	N321	5.54	73.7	4.1	0.006	N321-A	MH SB 32-2	8.2	76%	6.19	196	0.010
Total		16.58						16.56				

Table B1 - XPSWMM Existing Conditions Model Updates
I-35W Corridor Drainage Study

Drainage Area Updates												
Minneapolis Model Drainage Area						SEH Revised Drainage Area						
Node Name	**GIS Name**	**Area (ac)**	**Imp(%)**	**Total Imp Area (ac)**	**Slope**	**Name**	**XPSWMM Node Name**	**Area (ac)**	**Imp(%)**	**Total Imp Area (ac)**	**Width (ft)**	**Slope**
DS16 -SC1	DS16	22.65	56.40	12.8	0.011	DS16-A	DS16	6.35	47%	3.00	141	0.010
DS16-SC2	CBRB-81-2	25.4	65.40	16.6	0.018	DS16-B	CB NB 60-2	3.25	76%	2.48	312	0.005
DS16-SC3	MHNB-57-1	14.39	76.40	11.0	0.005	DS16-C	CB NB 55-2	9.19	80%	7.31	257	0.005
						DS16-D	MH R5 37-1	2.97	34%	1.00	66	0.020
						DS16-E	CBWB 236-2	4.89	49%	2.40	141	0.020
						DS15	DS15	4.39	59%	2.60	204	0.022
						CBRB-81-2	MH R5-37-1	25.4	65%	16.61	420	0.018
216-2	DS13	16.54	45.3	7.5	0.015	DS13	DS13	22.52	56%	12.50	164	0.015
Total		78.98						78.96				

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study
HENNC 113114
Date: 7.3.14
Model: 2014 Existing Conditions (Atlas 14)
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Tables

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
22-35W	1	16.1	0.020	2587	51.6
235-0	1	13.5	0.019	195	67.0
24/25-35WA	1	3.5	0.005	100	75.0
24/25-35WB	1	4.9	0.005	116	51.0
24-1st	1	5.1	0.015	1204	47.0
24-3rd	1	5.4	0.016	926	21.9
24-4th	1	3.0	0.027	528	41.1
24-Clin	1	2.1	0.032	419	50.7
24-Nic	1	3.1	0.016	727	75.0
24-Port	1	8.6	0.001	1003	44.7
24-Stev	1	4.0	0.021	1254	19.4
25-1st	1	7.7	0.013	1400	50.5
25-3rd	1	16.4	0.024	2116	71.8
25-4th	1	3.2	0.031	255	39.2
25-5th	1	7.8	0.023	1985	53.2
25-Clin	1	5.7	0.024	2020	40.9
25-Nic	1	2.9	0.015	690	82.9
25-Oak	1	7.7	0.006	1818	65.8
25-Port	1	9.0	0.012	2472	46.3
25-Stev	1	4.0	0.011	1054	82.6
26-1st	1	5.7	0.016	1194	58.0
26-35W	1	4.9	0.027	1429	46.3
26-Bla	1	2.7	0.022	996	58.1
26-Nic	1	7.1	0.021	985	69.7
26-Stev	1	8.3	0.016	1186	54.5
27-1st	1	8.4	0.009	1979	53.5
27-2nd	**1**	10.1	0.003	2248	47.7
27-35W	1	4.3	0.093	1464	40.1
27-3rd	1	9.0	0.037	1726	47.8
27-4th	1	5.0	0.009	516	95.0
27-5th	1	4.5	0.013	959	50.6

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
27-Bla	1	11.8	0.009	1856	52.4
27-Colum	1	1.4	0.008	326	56.9
27-Nic	1	10.9	0.010	**1859**	78.6
27-Oak	1	3.3	0.007	588	57.8
27-Park	1	2.1	0.008	314	67.4
27-Pils	1	9.9	0.006	2013	47.1
27-Port	1	8.4	0.007	1293	37.4
27-Stev	1	7.5	0.008	1661	46.4
28-1st	1	5.0	0.008	1135	63.2
28-35W	1	4.3	0.103	1542	52.2
28-4th	1	8.3	0.020	838	95.0
28-5th	1	10.5	0.019	1708	65.9
28-Bla	1	5.4	0.007	926	64.9
28-Colum	1	5.7	0.003	1685	73.7
28-Nic	1	5.0	0.007	729	89.9
28-Oak	1	6.1	0.005	1789	54.4
28-Park	1	6.9	0.004	1791	65.9
28-Port	1	5.6	0.012	1018	50.1
28-Stev	1	8.8	0.002	1019	55.5
29-2nd	1	2.1	0.003	202	36.5
29-35W	2	2.9	0.040	1474	67.8
29-35W	1	5.4	0.010	2455	67.8
29-3rd	1	3.0	0.001	486	43.1
29-4th	1	2.5	0.023	344	77.9
29-5th	1	16.9	0.036	2576	44.6
29-Bla	1	2.1	0.005	948	49.3
29-Clin	1	2.4	0.001	338	10.7
29-Nic	1	2.3	0.005	888	90.4
29-Pils	1	1.4	0.003	812	51.6
29-Pleas	1	0.7	0.006	133	80.5
29-Port	1	4.3	0.003	507	72.3
2Av-Clin	1	9.4	0.015	427	93.2
35TH_C	1	8.7	0.019	149	54.0
35TH_D	1	2.3	0.019	205	71.0
4_44	1	0.7	0.004	131	55.0
4_44	2	0.7	0.005	152	59.0
40TH	1	4.5	0.009	157	53.0
42_PL ALL	1	2.5	0.010	271	37.3
42ND	1	13.0	0.019	173	59.0
43_2	3	0.4	0.003	29	64.0
43_2	1	0.5	0.003	29	70.0
43_2	4	1.2	0.034	92	59.0
43_2	2	1.3	0.019	109	45.0
43_3	1	0.6	0.008	96	53.0

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
43_3	3	1.2	0.024	98	49.0
43_3	2	1.7	0.024	122	49.0
43_3	4	2.5	0.029	384	58.0
43_4	4	1.2	0.004	92	48.0
43_4	1	1.3	0.002	117	27.0
43_4	3	2.3	0.011	185	80.0
43_4	2	2.4	0.029	741	45.0
43_5	1	0.6	0.004	99	74.0
43_5	3	1.2	0.010	85	45.0
43_5	2	1.3	0.006	185	56.0
43_5	4	1.3	0.015	145	52.0
43_CL	1	1.3	0.006	166	56.0
43_PO	1	0.3	0.006	84	70.0
43_PO	2	1.4	0.011	111	55.0
43_PO	3	1.4	0.007	106	59.0
43_PO	4	1.6	0.003	123	57.0
44_2	1	0.4	0.002	25	70.0
44_2	2	1.3	0.000	97	52.0
44_3	1	0.4	0.015	62	68.0
44_3	2	0.4	0.020	85	63.0
44_3	3	1.2	0.004	94	50.0
44_3 ALL1	1	1.7	0.004	165	41.0
44_3 ALL2	1	1.3	0.029	161	31.0
44_3A	1	2.5	0.004	204	56.0
44_4	1	0.5	0.004	85	72.0
44_4	2	1.3	0.004	116	54.0
44_4	3	2.5	0.004	211	37.0
44_4A	1	1.4	0.004	109	58.0
44_5	3	1.2	0.018	115	53.0
44_5	2	1.2	0.008	105	55.0
44_5	1	1.9	0.006	118	42.0
44_5A	2	1.1	0.004	90	52.0
44_5A	3	1.3	0.004	101	49.0
44_5A	1	1.4	0.008	118	43.0
44_CL	1	0.5	0.004	87	51.0
44_CL	2	1.2	0.008	216	57.0
44_CL ALL	1	1.3	0.008	236	38.0
44_PO	3	1.1	0.018	145	52.0
44_PO	2	1.1	0.004	105	54.0
44_PO	1	1.6	0.003	117	54.0
44_PO	4	1.6	0.007	126	56.0
44_POA	2	1.6	0.010	117	55.0
44_POA	1	1.9	0.003	143	53.0
45_3	1	0.4	0.029	89	60.0
45_3	2	0.9	0.028	103	50.0

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
45_3	3	0.9	0.002	63	47.0
45_3 ALL	1	1.6	0.018	323	35.0
45_3B	1	1.3	0.002	106	48.0
45_4	3	0.4	0.004	78	66.0
45_4	4	0.5	0.004	80	59.0
45_4	2	0.6	0.004	87	61.0
45_4	1	0.6	0.003	87	59.0
45_5	2	0.3	0.004	57	60.0
45_5	1	1.3	0.006	120	45.0
45_CL	2	0.5	0.009	93	68.0
45_CL	1	0.5	0.004	89	58.0
45_CL	3	1.2	0.003	86	52.0
45_CL A	2	1.0	0.003	110	50.0
45_CL A	3	1.1	0.003	130	45.0
45_CL A	1	1.2	0.003	85	52.0
45_PL ALL	1	2.3	0.013	274	31.5
45_PO	2	0.5	0.006	123	58.0
45_PO	1	1.1	0.002	99	54.0
46_2 A	4	0.3	0.013	81	59.0
46_2 A	2	0.3	0.011	29	89.0
46_2 A	1	0.3	0.029	32	92.0
46_2 A	3	0.8	0.008	94	52.0
46_2 ALL	1	1.9	0.018	253	38.0
46_2 ALL1	1	2.0	0.017	377	40.0
46_3	2	0.4	0.027	74	74.0
46_3	3	0.5	0.041	82	60.0
46_3	4	1.1	0.014	82	51.0
46_3	1	1.2	0.002	88	46.0
46_3A	2	1.2	0.014	92	54.0
46_3A	1	2.4	0.002	155	88.0
46_4	1	0.8	0.006	102	66.0
46_4	4	1.2	0.021	89	58.0
46_4	2	1.6	0.004	137	43.0
46_4	3	2.1	0.020	141	47.0
46_4 A	1	0.6	0.003	80	69.0
46_4 A	2	1.8	0.016	143	89.0
46_4 ALL	1	2.0	0.004	202	12.0
46_5	1	0.6	0.004	107	76.0
46_5	2	1.1	0.004	82	45.0
46_5	3	1.3	0.004	106	44.0
46_5A	1	0.7	0.007	112	34.0
46_5A	3	1.2	0.007	86	53.0
46_5A	2	1.9	0.019	156	82.0
46_CL	2	0.9	0.013	127	48.0
46_CL	4	1.1	0.014	86	50.0

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
46_CL	1	1.2	0.002	95	66.0
46_CL	3	2.3	0.009	137	40.0
46_CL A	1	1.1	0.003	83	59.0
46_CL A	2	1.2	0.022	92	49.0
46_GA ALL	1	2.4	0.017	242	31.0
46_LY ALL	1	2.0	0.021	267	33.5
46_PO	2	0.8	0.004	126	63.0
46_PO	4	1.5	0.008	107	61.0
46_PO	1	1.6	0.003	118	60.0
46_PO	3	1.8	0.009	131	38.0
46_PO A	3	0.4	0.009	71	83.0
46_PO A	2	1.3	0.004	96	57.0
46_PO A	4	1.4	0.004	109	61.0
46_PO A	1	1.9	0.003	123	50.0
46TH-1	1	3.0	0.007	300	95.0
46TH-10	1	1.7	0.007	300	95.0
46TH-11	1	1.5	0.007	300	95.0
46TH-12	1	2.0	0.007	300	95.0
46TH-13	1	2.3	0.007	300	95.0
46TH-14	1	4.1	0.007	300	95.0
46TH-15	1	3.8	0.005	748	30.0
46TH-2	1	1.6	0.007	300	95.0
46TH-2	2	2.4	0.007	300	95.0
46TH-3	1	1.3	0.007	300	95.0
46TH-4	1	1.4	0.007	300	95.0
46TH-5	1	3.1	0.007	300	95.0
46TH-6	1	1.1	0.007	300	95.0
46TH-7	1	3.0	0.007	300	95.0
46TH-8	1	2.4	0.007	300	95.0
46TH-9	1	1.2	0.007	300	95.0
47_2	2	0.4	0.015	25	65.0
47_2	1	1.4	0.018	105	44.0
47_3	1	0.4	0.012	62	59.0
47_3	4	1.2	0.015	87	53.0
47_3	3	1.4	0.018	110	46.0
47_3	2	1.8	0.013	114	50.0
47_5	1	0.6	0.030	117	56.0
47_5	2	0.7	0.025	86	52.0
47_CL	2	0.4	0.005	77	67.0
47_CL	1	1.1	0.020	98	51.0
47_CL	3	1.8	0.018	129	42.0
47_CL A	2	0.5	0.013	72	53.0
47_CL A	1	0.6	0.020	99	58.0
47_CL A	3	1.2	0.017	96	54.0
47_LY ALL	1	2.4	0.002	266	33.3

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
47_PO	1	0.4	0.014	83	58.0
47_PO	2	0.4	0.018	67	58.0
48_3	1	0.4	0.004	83	60.0
48_3	2	0.5	0.013	91	56.0
48_4	3	0.3	0.045	61	54.0
48_4	1	1.2	0.007	86	59.0
48_4	2	2.2	0.011	151	43.0
48_4 A	1	1.2	0.012	104	58.0
48_5	4	0.5	0.028	114	50.0
48_5	2	1.2	0.012	84	51.0
48_5	1	1.3	0.015	95	45.0
48_5	3	1.9	0.021	132	44.0
48_5 ALL	1	1.7	0.016	151	46.0
48_BL	1	0.4	0.044	66	61.0
48_BL	2	0.6	0.077	107	52.0
48_BL ALL	1	2.9	0.013	276	53.0
48_CL	2	0.4	0.020	94	63.0
48_CL	1	0.9	0.012	114	41.0
48_NI	1	0.3	0.004	47	73.0
48_NI	4	0.4	0.019	83	85.0
48_NI	2	0.4	0.004	65	71.0
48_NI	3	0.4	0.026	101	72.0
48_NIA	1	0.6	0.023	123	71.0
48_NIA	2	0.8	0.022	196	65.0
48_PO	2	0.4	0.005	77	60.0
48_PO	3	0.6	0.020	103	56.0
48_PO	1	1.2	0.016	102	58.0
48_PO A	1	1.5	0.009	116	56.0
48_ST	4	0.4	0.003	27	69.0
48_ST	1	0.5	0.048	67	58.0
48_ST	2	0.6	0.057	110	62.0
48_ST	3	1.2	0.010	85	52.0
48_WE	4	0.4	0.047	45	60.0
48_WE	1	0.5	0.031	82	51.0
48_WE	3	0.8	0.048	117	51.0
48_WE	2	1.1	0.042	150	34.0
49_1	1	0.4	0.092	78	49.0
49_1	3	1.0	0.093	105	46.0
49_1	4	1.2	0.086	94	50.0
49_1	2	1.7	0.071	128	50.0
49_2	3	0.5	0.029	34	48.0
49_2	1	0.5	0.008	36	48.0
49_2	4	1.0	0.032	74	49.0
49_2	2	1.2	0.014	80	50.0
49_2 ALL	1	1.7	0.030	223	38.0

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
49_3	4	0.2	0.108	67	45.0
49_3	2	0.5	0.008	83	56.0
49_3	3	0.8	0.050	113	54.0
49_3	1	1.2	0.020	102	50.0
49_3 A	2	0.2	0.008	77	54.0
49_3 A	1	1.2	0.018	96	51.0
49_4	3	0.5	0.012	89	52.0
49_4	1	1.3	0.017	110	57.0
49_4	2	2.1	0.028	120	45.0
49_4 A	2	0.5	0.004	96	61.0
49_4 A	1	1.1	0.015	94	62.0
49_4 A	3	2.3	0.014	172	54.0
49_5	1	1.1	0.015	90	55.0
49_5	2	1.2	0.013	93	51.0
49_5 ALL	1	1.3	0.020	187	48.0
49_CL	4	0.4	0.046	72	59.0
49_CL	2	1.2	0.031	89	54.0
49_CL	1	1.3	0.030	94	57.0
49_CL	3	2.2	0.029	138	46.0
49_NI	3	1.0	0.036	95	52.0
49_NI	2	4.4	0.050	353	61.0
49_NI	1	4.5	0.033	238	40.0
49_RU ALL2	1	0.6	0.013	381	39.0
49_ST	4	0.5	0.058	82	44.0
49_ST	2	0.6	0.042	79	45.0
49_ST	3	2.2	0.080	129	47.0
49_ST	1	2.8	0.043	181	45.0
49_ST A	1	0.3	0.067	62	33.0
49_ST A	2	0.4	0.026	69	26.0
49_WE	4	0.2	0.008	65	56.0
49_WE	3	0.2	0.007	59	58.0
49_WE	2	1.3	0.003	162	46.0
49_WE	1	4.4	0.069	535	33.0
5_43 ALL	1	0.8	0.017	149	45.0
5_46 ALL	1	1.7	0.006	200	47.0
50_1	2	0.2	0.046	70	48.0
50_1	1	0.4	0.095	96	43.0
50_BE	1	0.2	0.037	40	77.0
50_NI	1	0.5	0.045	66	66.0
50_NI	3	0.9	0.061	114	53.0
50_NI	2	1.2	0.047	123	53.0
50_NI A	1	0.2	0.003	36	75.0
50_NI A	3	1.0	0.042	94	61.0
50_NI A	2	1.4	0.075	152	39.0
50_ST A	4	0.4	0.009	36	50.0

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
50_ST A	1	0.4	0.067	85	63.0
50_ST A	3	0.9	0.025	101	47.0
50_ST A	2	1.0	0.084	117	47.0
51_ST	2	0.4	0.027	54	44.0
51_ST	1	1.1	0.072	120	49.0
B5496	1	1.2	0.009	300	95.0
B5501	1	2.1	0.009	300	95.0
B5573	1	4.8	0.019	230	0.8
BE_50	1	0.4	0.048	68	55.0
BE_50	2	1.5	0.030	145	46.0
BE_50	3	2.2	0.045	172	31.0
BE_61	1	0.4	0.058	127	54.0
BE_61	2	0.6	0.087	180	50.0
BE_61	3	0.6	0.087	114	41.0
C5427	1	1.6	0.009	300	95.0
C5429	1	2.1	0.009	300	95.0
CB NB 55-2	1	9.2	0.005	257	80.0
CB NB 60-2	1	3.3	0.005	312	76.0
CBWB 236-2	1	4.9	0.020	141	49.0
D6172	1	3.3	0.004	668	86.0
D6504	1	0.6	0.017	276	95.0
D6572	1	1.2	0.014	464	68.3
D6616	1	1.1	0.002	175	61.5
D6706	1	1.6	0.005	502	40.0
D6708	1	1.9	0.018	566	69.4
D6720	1	2.1	0.012	524	87.3
D6774	1	1.3	0.009	425	89.3
D6780	1	2.5	0.004	583	52.3
D6813	1	4.5	0.018	1179	60.5
D6844	1	2.4	0.021	441	73.6
D6846	1	2.7	0.014	459	60.3
D6847	1	1.4	0.018	1008	53.6
D6852	1	1.8	0.030	515	75.0
D6853	1	2.5	0.008	639	31.8
D6865	1	0.6	0.048	625	66.1
D6948	1	0.8	0.034	610	67.2
D7121	1	4.2	0.012	833	56.9
D7150	1	4.1	0.018	820	51.9
D7163	1	3.3	0.032	1128	52.2
D7165	1	3.4	0.011	1172	55.2
D7170	1	1.6	0.022	701	60.0
D7176	1	2.5	0.020	227	60.0
D7181	1	2.7	0.012	469	62.7
D7264	1	1.9	0.010	544	53.8
D7436	1	5.5	0.017	999	50.5

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
D7552	1	4.9	0.011	408	61.9
D7746	1	1.2	0.009	63	77.2
D7886	1	1.5	0.025	998	71.9
DS1(39th)	1	6.9	0.008	181	61.0
DS13	1	22.5	0.015	164	56.0
DS15	1	4.4	0.022	204	59.0
DS16	1	6.4	0.010	141	47.0
DS2(35th)	1	13.5	**0.019**	195	67.0
DS3(31ST)	1	6.0	0.005	170	58.0
DS6	1	40.6	0.016	1814	58.9
DS7	3	6.0	0.019	525	93.5
DS7	4	9.3	0.006	2058	93.5
DS7	2	9.4	0.014	1212	93.5
DS7	5	16.1	0.023	2754	93.5
DS7	1	52.8	0.009	3433	51.9
G7893	1	2.8	0.002	405	44.8
G7903	1	1.0	0.014	142	47.7
G7922	1	3.2	0.003	306	47.1
G7944	1	2.0	0.004	416	42.7
G7955	1	1.1	0.018	280	77.7
G7985	1	1.6	0.036	298	82.8
G8254	1	2.6	0.001	197	50.9
G8255	1	5.5	0.006	830	51.2
G8261	1	3.0	0.018	406	49.6
G8275	1	3.1	0.030	700	17.9
G8276	1	4.2	0.008	687	41.9
G8326	1	1.3	0.013	896	46.6
G8374	1	4.8	0.015	736	74.7
G8380	1	1.4	0.030	758	67.5
G8502	1	1.2	0.068	351	37.7
G8594	1	3.5	0.087	678	51.9
G8611	1	1.9	0.023	704	60.0
G8618	1	1.0	0.006	312	38.3
G8620	1	5.3	0.071	733	61.1
G8710	1	2.8	0.009	423	56.8
G8721	1	1.3	0.049	848	51.6
G8745	1	5.8	0.027	805	54.5
G8765	1	3.5	0.001	632	59.2
G8768	1	2.7	0.025	405	69.8
G8778	1	3.7	0.009	657	56.3
G8783	1	1.1	0.054	913	63.4
G8805	1	1.3	0.036	111	41.3
G8820	1	2.2	0.036	516	60.0
G9139	1	1.8	0.075	416	62.6
G9146	1	4.2	0.045	152	65.2

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
G9147	1	2.3	0.110	663	60.3
G9155	1	1.9	0.024	1100	82.6
G9165	1	3.6	0.024	396	81.9
G9226	1	4.7	0.029	377	55.3
G9233	1	5.3	0.024	526	72.6
G9270	1	5.2	0.033	358	79.8
G9274	1	8.0	0.006	800	56.7
G9284	1	3.5	0.003	448	77.9
G9288	1	6.1	0.004	358	81.4
G9289	1	2.1	0.015	1308	62.6
I7166	1	7.4	0.003	254	70.9
I7177	1	6.1	0.003	431	60.1
I7312	1	19.6	0.013	1117	94.5
I7336	1	2.6	0.012	312	94.4
I7553	1	2.3	0.009	555	86.2
J10110	1	4.3	0.016	921	48.3
J10190	1	2.5	0.042	1069	39.5
J10219	1	1.6	0.044	1224	37.4
J10409	1	2.5	0.053	1296	44.9
J10521	1	7.9	0.006	833	47.8
J10533	1	4.8	0.010	391	47.1
J10613	1	6.4	0.002	546	44.3
J10621	1	9.4	0.005	1132	70.5
J10629	1	4.9	0.020	357	45.2
J10632	1	5.0	0.050	638	44.1
J10642	1	4.3	0.016	384	49.6
J11109	1	12.4	0.008	742	55.9
J11159	1	6.0	0.002	508	39.6
J11163	1	7.1	0.006	536	63.4
J11170	1	2.8	0.025	417	37.5
J11176	1	0.7	0.039	653	44.8
J11186	1	6.3	0.011	492	50.8
J11211	1	3.3	0.006	513	42.5
J11226	1	9.2	0.012	672	36.2
J11227	1	9.2	0.008	648	39.7
J11637	1	5.1	0.009	355	41.3
J4567	1	0.8	0.026	751	48.9
J4596	1	2.4	0.004	259	60.0
J4597	1	2.6	0.007	198	45.8
J4734	1	5.6	0.008	750	60.4
J4859	1	4.1	0.012	972	54.7
J4891	1	1.0	0.019	635	60.0
J4937	1	6.3	0.021	1039	90.6
J4977	1	1.1	0.001	769	69.3
J5104	1	1.1	0.017	816	95.0

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
J5228	1	1.1	0.029	539	42.4
J5236	1	5.5	0.013	648	83.2
J5285	1	5.4	0.021	1052	60.0
J5293	1	3.3	0.020	460	94.8
J5323	1	1.6	0.058	580	39.5
J5516	1	2.6	0.030	822	50.5
J5537	1	4.3	0.019	643	59.3
J5648	1	3.5	0.023	501	83.0
J5683	1	2.6	0.052	652	31.2
J5752	1	4.5	0.015	556	45.1
J5965	1	6.2	0.054	670	33.7
J6011	1	5.1	0.013	773	58.1
J6079	1	6.0	0.021	745	70.7
J6131	1	4.6	0.009	788	36.8
J6164	1	4.0	0.006	338	80.1
J6237	1	1.3	0.026	177	0.0
J6463	1	6.1	0.028	1035	0.0
J6471	1	5.9	0.022	632	38.7
J6477	1	4.6	0.014	616	62.1
J6483	1	3.5	0.004	495	58.3
J6501	1	4.4	0.030	666	80.8
J6507	1	2.0	0.034	467	60.0
J6517	1	7.6	0.027	657	49.2
J6721	1	5.9	0.034	136	23.2
J6806	1	2.5	0.016	427	60.0
J6811	1	1.8	0.008	85	84.4
J6876	1	3.5	0.013	454	60.2
J6883	1	3.6	0.015	483	64.5
J7000	1	3.7	0.019	1270	30.0
J7009	2	7.2	0.010	1	100.0
J7009	1	23.1	0.037	2066	0.0
J7027	1	16.6	0.046	1776	58.6
J7032	1	2.4	0.113	448	30.0
J7067	1	2.6	0.110	376	34.3
J7070	1	7.4	0.119	645	86.3
J7361	1	4.6	0.014	452	65.8
J7377	1	7.9	0.047	419	54.8
J7391	1	7.8	0.090	1311	77.9
J7411	1	1.1	0.054	533	31.0
J7425	1	2.6	0.137	392	52.3
J7445	1	1.4	0.029	600	30.5
J7576	1	2.6	0.080	433	78.5
J7609	1	4.0	0.032	293	66.9
J7611	1	2.0	0.019	572	58.3
J7663	1	13.5	**0.046**	1669	58.1

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
J7735	1	1.9	0.047	233	60.0
J7774	1	2.3	0.044	867	14.3
J7776	1	2.8	0.008	426	27.2
J7781	1	1.2	0.035	245	33.3
J8085	1	2.3	0.009	584	55.7
J8108	1	2.2	0.021	190	46.9
J8442	1	9.8	0.027	2173	66.8
J8475	1	1.1	0.023	449	42.0
J8558	1	1.4	0.012	496	48.1
J8625	1	3.4	0.270	2057	49.3
J8838	1	3.6	0.066	1168	45.5
J8846	1	1.6	0.022	430	59.6
J8847	1	1.1	0.015	269	55.3
J8863	1	3.4	0.072	500	59.6
J8877	1	1.6	0.016	351	52.6
J9041	1	5.0	0.021	912	60.7
J9162	1	2.0	0.055	458	48.7
J9174	1	1.2	0.002	317	60.0
J9185	1	1.4	0.012	526	60.0
J9190	1	1.9	0.043	412	40.7
J9461	1	2.6	0.024	1270	60.8
J9797	1	14.5	0.005	1279	66.2
J9802	1	5.1	0.044	381	52.5
J9811	1	4.1	0.004	1474	56.5
J9817	1	6.2	0.022	502	54.6
J9885	1	0.9	0.032	673	62.8
J9920	1	1.8	0.022	1292	49.7
J9923	1	6.4	0.005	532	52.1
J9941	1	5.1	0.029	388	51.0
J9952	1	6.5	0.028	546	45.0
JDOT1	1	5.4	0.018	200	55.5
JDOT2	1	20.7	0.010	663	74.8
JDOT3	1	6.5	0.026	247	89.0
JDOT4	1	5.1	0.036	2490	88.5
JDUNWOODY	1	10.3	0.009	1000	42.0
JMPRB1	1	15.7	0.009	1109	42.5
JMPRB2	1	17.3	0.010	588	50.2
JUNCT	1	14.9	0.011	750	45.9
L14613	1	1.7	0.024	1194	55.1
L14670	1	1.6	0.001	301	63.3
L14678	1	1.6	0.001	337	42.8
L14984	1	4.5	0.006	378	32.8
L14989	1	6.0	0.005	170	42.4
L15000	1	4.6	0.006	381	35.4
L15005	1	4.9	0.009	392	38.8

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
L15012	1	8.4	0.009	647	47.2
L15417	1	1.2	0.020	360	46.8
L15533	1	6.0	0.005	170	58.0
L15577	1	5.4	0.002	851	33.8
L15581	1	4.7	0.002	377	35.1
L15587	1	1.4	0.044	1055	35.4
L15588	1	5.2	0.002	406	38.0
L15596	1	2.9	0.002	549	51.8
L15605	1	4.3	0.002	402	42.2
L15854	1	2.0	0.017	787	52.3
L15862	1	10.8	0.006	1126	46.6
L15870	1	6.5	0.005	492	38.5
L16086	1	2.0	0.003	322	43.3
L16228	1	2.1	0.005	231	41.8
L16318	1	0.7	0.009	613	40.5
Lake-2nd	1	2.2	0.020	367	51.4
Lake-3rd	1	1.6	0.004	634	68.6
Lake-4th	1	6.4	0.001	1388	80.9
Lake-Clin	1	5.6	0.011	1395	64.4
LORINGPK	1	2.6	0.008	382	58.0
M13902	1	1.1	0.011	244	30.0
M13907	1	1.1	0.031	308	44.8
M14298	1	5.2	0.003	560	66.6
M14368-1	1	4.8	0.002	597	54.1
M14368-2	1	1.1	0.002	597	85.0
M14370	1	3.6	0.005	746	95.0
M14371	1	8.6	0.002	381	95.0
M14578	1	3.3	0.007	414	46.5
M14695	1	2.4	0.010	498	89.6
M14714	1	2.5	0.006	558	95.0
M15022	1	9.4	0.008	610	71.8
M15027	1	5.5	0.006	475	75.9
M15041	1	10.4	0.004	831	73.9
M15102	1	11.3	0.007	828	49.5
M15119	1	7.6	0.003	756	61.2
MH R5 37-1	1	3.0	0.020	66	34.0
MH R5 37-1	2	25.4	0.018	420	65.0
MH SB 32-2	1	8.2	0.010	196	76.0
MH SB 32-4	1	4.4	0.022	204	59.0
MHLN81-3	1	5.3	0.039	624	60.2
N16989	1	5.3	0.006	415	42.0
N17001	1	5.5	0.006	407	32.4
N17019	1	4.6	0.005	452	35.8
NI_RU	4	0.8	0.032	96	39.0
NI_RU	1	1.4	0.037	104	51.0

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
NI_RU	2	2.0	0.035	115	41.0
NI_RU	3	3.1	0.029	148	58.0
O17590	1	5.3	0.020	976	40.9
O17593	1	1.5	0.053	1282	38.2
O17608	1	4.7	0.015	380	36.6
O17636	1	6.8	0.018	837	43.0
O17675	1	8.0	0.015	387	46.2
O17695	1	4.4	0.018	401	34.4
O17993	1	2.1	0.018	932	38.8
O18000	1	2.2	0.023	283	30.6
O18169	1	4.0	0.008	49	39.8
O18174	1	9.6	0.014	1346	34.9
O18178	1	14.0	0.009	1113	38.3
O18191	1	5.1	0.008	645	32.0
O18192	1	4.6	0.006	174	35.6
O18197	1	3.2	0.009	70	40.8
O18600	1	2.2	0.026	251	32.8
O18618	1	2.3	0.011	310	32.3
O18777	1	1.7	0.010	246	40.5
O18907	1	7.7	0.022	1305	32.0
O18928	1	2.2	0.051	1176	41.2
O18930	1	2.3	0.015	1039	42.1
O18941	1	0.6	0.055	259	32.5
O19212	1	1.1	0.032	380	34.2
O19213	1	6.9	0.012	709	58.3
O19440	1	2.3	0.056	1207	35.8
O19446	1	1.4	0.023	1300	39.6
O19455	1	1.6	0.017	1329	69.3
P16324	1	0.7	0.060	634	32.8
P16380	1	1.8	0.011	358	56.9
P16521	1	1.1	0.027	787	55.5
P16672	1	1.6	0.014	1007	53.4
P16727	1	3.4	0.022	586	54.7
P17018	1	1.1	0.039	816	39.4
P17026	1	5.1	0.007	394	37.5
P17032	1	4.9	0.012	361	45.6
P17041	1	1.2	0.022	864	44.9
P17051	1	1.9	0.022	1090	54.4
P17061	1	9.0	0.016	1110	47.8
P17272	1	2.1	0.037	503	49.2
P17357	1	3.6	0.017	446	32.6
P17696	1	8.1	0.014	688	36.3
P17699	1	7.1	0.013	596	38.2
P17718	1	8.4	0.018	671	46.5
P17719	1	2.2	0.022	1191	53.0

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
P17735	1	1.9	0.032	724	31.8
P17745	1	6.8	0.011	519	33.7
P17754	1	1.2	0.051	684	40.2
P17755	1	1.7	0.016	1297	31.8
P17801	1	1.0	0.027	656	34.0
P17912	1	1.9	0.012	1208	35.9
P17914	1	6.8	0.008	817	40.6
P17950	1	3.1	0.008	285	37.1
P17959	1	3.6	0.018	418	34.5
P17987	1	2.2	0.017	297	49.9
P18143	1	1.2	0.022	633	34.7
P18247	1	0.9	0.029	622	39.3
P18270	1	2.7	0.016	422	39.8
P18338	1	6.0	0.007	1184	30.4
P18354	1	4.8	0.008	502	35.1
P18411	1	7.7	0.010	569	34.8
P18426	1	9.2	0.009	636	44.3
P18434	1	10.9	0.011	598	37.4
P18442	1	8.8	0.011	681	37.5
P18451	**1**	10.1	0.013	659	37.5
P18454	1	9.4	0.011	668	42.0
P18460	1	6.9	0.009	556	48.6
P18479	1	1.8	0.018	1218	36.9
P18510	1	2.7	0.026	1171	54.9
P18603	1	2.4	0.013	265	42.4
P18658	1	2.9	0.010	510	32.4
P18671	1	2.4	0.025	390	35.4
P18943	1	4.1	0.021	1495	34.6
P18950	1	2.4	0.008	324	33.3
P19021	1	2.5	0.020	456	38.3
P19070	1	3.4	0.008	684	40.3
P19101	1	0.9	0.013	671	38.1
P19144	1	0.7	0.016	656	43.2
P19147	1	0.7	0.013	594	54.0
P19148	1	0.7	0.022	660	39.1
P19214	1	3.2	0.032	381	33.6
R1	1	1.2	0.028	235	30.7
R113	1	9.2	0.020	791	31.7
R127	1	4.9	0.028	363	34.9
R130	1	5.2	0.021	377	32.2
R136	1	13.8	0.018	1156	39.4
R14	1	0.6	0.080	289	32.0
R142	1	5.1	0.013	592	30.5
R144	1	1.5	0.020	1296	30.5
R172	1	1.4	0.074	300	30.2

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
R175	1	4.8	0.028	1684	36.2
R194	1	9.2	0.028	1895	30.5
R197	1	4.5	0.021	358	30.1
R201	1	3.3	0.016	404	27.8
R206	1	3.1	0.030	472	23.1
R233	1	2.0	0.040	261	30.4
R242	1	5.1	0.013	1281	30.2
R255	1	3.7	0.015	397	32.4
R258	1	2.6	0.014	420	31.7
R260	1	5.3	0.015	348	32.0
R263	1	4.6	0.046	919	1.0
R266	1	4.6	0.018	372	31.9
R50	1	4.9	0.014	372	37.3
R51	1	2.2	0.060	1107	43.2
R53	1	2.8	0.015	431	32.0
R54	1	18.2	0.032	1256	15.2
R56	1	5.0	0.015	385	36.2
R61	1	5.1	0.023	381	37.4
R69	1	5.1	0.028	379	35.2
R70	1	3.0	0.023	387	34.1
R78	1	3.8	0.053	398	31.5
R8	1	2.2	0.012	77	34.4
R9	1	0.7	0.016	652	39.3
R93	1	1.2	0.045	411	33.9
R95	1	1.8	0.052	275	30.5
RU	1	3.5	0.013	482	47.0
ST_49 F	2	0.3	0.068	28	62.0
ST_49 F	1	0.8	0.082	93	48.0
ST_RU	4	0.3	0.017	36	43.0
ST_RU	1	0.6	0.036	50	51.0
ST_RU	3	1.1	0.054	186	39.0
ST_RU	2	2.0	0.023	136	52.0
T19194	1	0.7	0.036	625	37.7
T19291	1	1.5	0.010	369	35.1
T19316	1	1.0	0.006	283	46.3
T19491	1	1.4	0.005	577	36.8
T19507	1	1.0	0.043	752	35.0
T19510	1	0.7	0.047	674	40.6
T19513	1	3.3	0.017	904	52.2
T19643	1	2.2	0.016	666	63.3
T19678	1	6.5	0.005	501	46.4
T19696	1	7.5	0.004	598	46.5
T19703	1	7.3	0.003	586	36.7
T19705	1	7.7	0.003	620	31.7
T19708	1	10.2	0.002	660	36.1

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
T19714	1	6.5	0.004	517	32.1
T19716	1	8.6	0.004	636	40.3
T19718	1	2.0	0.046	1245	32.5
T19825	1	8.5	0.015	1181	34.7
T19878	1	3.5	0.007	407	37.9
T19918	1	1.5	0.022	948	34.7
T19946	1	2.4	0.007	304	49.8
T20349	1	6.4	0.023	619	41.3
T20452	1	6.3	0.004	487	35.5
T20463	1	3.4	0.002	604	34.8
T20468	1	1.2	0.005	103	33.5
T20473	1	5.0	0.022	388	36.6
T20481	1	7.1	0.002	554	39.3
T20499	1	5.9	0.003	611	34.5
T20511	1	5.2	0.012	361	35.3
T20520	1	5.5	0.003	480	31.0
T20531	1	4.9	0.012	383	43.6
T20551	1	1.8	0.027	237	28.0
T20714	1	3.0	0.023	492	36.2
T20738	1	4.2	0.010	610	38.2
T20761	1	2.6	0.011	402	31.6
T20831	1	1.2	0.004	250	30.0
T21001	1	6.1	0.026	790	32.9
T21168	1	4.9	0.036	762	30.7
T21175	1	5.2	0.029	533	31.8
T21176	1	2.6	0.026	1227	32.7
T21262	1	4.4	0.012	397	30.9
T21280	1	4.1	0.017	389	32.1
T21291	1	5.1	0.017	378	31.3
T21296	1	2.3	0.051	1308	33.2
T21299	1	5.3	0.026	969	35.5
T21305	1	5.0	0.018	388	30.8
T21320	1	5.3	0.010	388	34.4
T22072	1	5.0	0.005	1269	34.4
T22077	1	0.7	0.046	665	30.0
T22082	1	4.9	0.009	380	30.6
T22083	1	1.9	0.003	446	42.7
T22090	1	0.7	0.056	659	30.0
T22096	1	2.9	0.023	1121	32.3
T22233	1	2.6	0.014	294	30.0
T22263	1	2.6	0.016	227	35.6
T22683	1	0.8	0.024	673	55.6
T22812	1	3.0	0.020	406	30.0
T22824	1	4.5	0.011	641	31.7
T22962	1	2.1	0.010	271	37.3

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
T23434	1	7.2	0.014	598	31.1
T23563	1	5.3	0.010	635	32.2
T23794	1	1.8	0.052	574	31.2
T24297	1	0.8	0.017	425	37.7
T24319	1	0.4	0.038	324	30.0
T24331	1	0.8	0.013	622	31.2
T99991	1	3.8	0.035	1000	57.5
T99992	1	4.2	0.060	1100	36.0
U20747	1	1.9	0.007	1184	57.0
U20795	1	2.9	0.022	267	53.5
U21092	1	1.1	0.015	1199	42.3
U21149	1	8.0	0.021	1185	28.7
U21211	1	5.3	0.014	294	25.5
U21230	1	5.2	0.027	253	30.5
U21809	1	4.5	0.012	802	30.9
U21949	1	4.5	0.039	422	27.5
U21973	1	3.4	0.016	389	31.0
U22005	1	1.1	0.028	588	30.0
U22192	1	2.3	0.016	347	30.8
U22485	2	7.4	0.071	977	0.0
U22485	1	7.6	0.048	1104	0.0
U22511	1	2.6	0.007	567	31.2
U22515	1	2.9	0.051	1156	10.4
U22569	1	4.6	0.011	431	27.4
U22587	1	4.9	0.012	396	41.5
U22606	1	1.3	0.057	584	30.0
U22634	1	2.4	0.008	439	31.7
U22749	1	2.1	0.046	1316	30.3
U22817	1	7.9	0.016	758	30.2
U22942	1	1.2	0.008	353	35.5
U22992	1	2.7	0.026	355	36.6
U23429	1	3.3	0.023	359	32.3
U23442-1	1	3.2	0.008	377	45.8
U23442-2	1	1.6	0.023	171	45.8
U23453	1	4.2	0.007	397	60.9
U23480	1	5.1	0.015	405	31.7
U23502	1	5.3	0.017	385	31.1
U23526	1	6.1	0.024	577	32.7
U23539	1	7.3	0.016	553	31.3
U23733-1	1	2.2	0.014	727	32.2
U23733-2	1	2.1	0.014	727	32.2
U23765	1	2.7	0.045	417	33.5
U23790	1	1.0	0.009	328	30.0
U24127	1	2.0	0.014	452	30.0
U24165	1	0.7	0.010	634	58.6

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
U24190	1	5.5	0.010	394	57.4
U24206-1	1	4.8	0.005	558	31.4
U24206-2	1	2.2	0.068	347	31.4
U24237	1	4.6	0.062	841	31.1
U24254	1	1.4	0.010	210	31.6
U24793	1	15.1	0.018	1355	34.6
U24812	1	9.5	0.011	661	46.4
U24837	1	2.8	0.065	1059	31.7
U24876	1	5.9	0.012	586	33.3
U24884	1	5.1	0.012	371	30.0
U24889	1	7.6	0.006	583	33.7
U24890	1	0.2	0.077	193	30.0
U24901	1	2.2	0.050	1334	30.5
U24908	1	4.9	0.043	678	30.8
U24935	1	13.3	0.007	1231	33.0
U24966	1	2.9	0.015	369	30.6
U24987	1	2.6	0.023	389	30.5
U25002	1	2.4	0.023	330	31.4
U25262	1	4.2	0.019	603	30.9
U25290	1	3.1	0.015	398	35.1
U25301	1	0.8	0.017	689	52.9
U25314	1	0.9	0.036	624	37.4
U25327	1	2.7	0.017	1193	30.0
U25330	1	2.5	0.003	1097	30.8
U25374	1	2.7	0.009	417	43.0
U25390	1	2.9	0.008	422	36.1
U25401	1	0.7	0.045	650	42.0
U25403	1	0.8	0.006	638	30.7
U25410	1	5.2	0.019	382	32.7
U25437	1	4.6	0.017	987	32.0
U25490	1	2.8	0.017	289	63.3
U25559	1	2.2	0.018	253	30.5
U25863	1	5.1	0.043	569	30.0
U25888	1	1.7	0.025	1229	44.5
U25890	1	6.7	0.010	538	36.6
U25895	1	2.5	0.017	459	53.2
U25936	1	6.9	0.005	562	31.4
U25955	1	6.9	0.015	531	31.3
U25965	1	9.1	0.019	684	30.7
U25976	1	9.6	0.020	649	33.5
U25981	1	7.3	0.008	573	39.6
U25991	1	7.0	0.013	547	31.0
U25998	1	6.5	0.017	568	34.2
U26020	1	5.2	0.030	369	35.3
U26029	1	4.9	0.024	283	30.4

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
U26106	1	2.5	0.040	245	30.5
U26127	1	2.4	0.022	300	31.4
U26487	1	0.8	0.008	633	25.4
U26521	1	4.7	0.065	382	33.9
U26556	1	5.1	0.041	394	27.2
U26560	1	3.5	0.024	369	30.1
U26563	1	4.9	0.025	409	31.1
U26570	1	5.4	0.008	370	30.0
U26585	1	4.9	0.036	917	31.4
U26704	1	2.4	0.092	303	11.9
U27025	1	4.1	0.013	816	60.0
U27229	1	2.9	0.057	646	30.1
U27399	1	3.1	0.045	543	43.7
U27577	1	7.3	0.042	1034	34.1
U27793	1	4.3	0.047	827	35.2
V13912	1	0.7	0.002	367	32.9
V13967	1	2.6	0.006	1044	84.4
V14356-1	1	4.2	0.003	645	54.8
V14356-2	1	4.2	0.003	645	54.8
V14497	1	2.3	0.032	447	79.5
V14500-1	1	4.8	0.001	596	67.6
V14500-2	1	2.3	0.001	596	67.6
V14521-1	1	3.8	0.005	475	75.1
V14521-2	1	1.2	0.005	475	75.1
V14625	1	2.1	0.001	336	58.7
V15134	1	4.3	0.003	943	75.7
V15144	1	0.8	0.006	654	51.3
V15177	1	5.2	0.001	387	54.4
V15211	1	6.0	0.003	1086	42.9
V15388	1	1.8	0.006	288	43.8
V15871	1	5.3	0.003	399	44.8
V15885	1	2.2	0.023	1288	48.5
V15889	1	4.5	0.004	447	36.9
V15897	1	13.9	**0.012**	1302	29.3
V15898	1	7.7	0.006	578	44.8
V15900	1	9.2	0.009	675	41.8
V15900	2	13.9	0.012	1302	29.3
V15943	1	4.5	0.004	424	36.8
V16087	1	2.4	0.027	1349	34.1
V16160	1	2.3	0.009	289	58.0
V16563	1	3.2	0.001	576	49.1
V16565	1	8.1	0.004	632	42.0
V16568	1	7.3	0.004	597	35.9
V16572	1	3.0	0.007	473	33.7
V16577	1	4.8	0.006	382	36.1

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
V16578	1	11.1	0.005	1276	27.0
V16582	1	1.6	0.037	1102	38.0
V16583	1	4.8	0.009	392	35.8
V16589	1	4.5	0.008	382	31.6
V17049	1	7.7	0.004	833	38.7
V17147	1	3.9	0.010	379	36.0
V17150	1	4.7	0.010	390	36.8
V17153	1	3.4	0.005	414	32.8
V17170	1	2.8	0.002	403	41.9
V17182	1	5.1	0.003	381	42.7
V17218	1	7.3	0.013	808	39.3
V17219	1	3.1	0.043	1006	52.5
V17295	1	3.2	0.005	506	37.7
V17346	1	4.1	0.006	564	59.1
V17354	1	2.3	0.008	278	58.9
V17785	1	2.1	0.015	502	39.7
V17827	1	1.1	0.010	598	34.6
V17828	1	1.4	0.020	454	41.3
V17831	1	11.7	0.045	2432	43.5
V17840	1	3.9	0.006	305	33.4
V17846	1	12.3	0.007	1203	48.7
V17863	1	0.8	0.012	654	39.0
V17870	1	0.9	0.004	595	62.5
V17875	1	2.5	0.013	447	49.2
V17884	1	2.8	0.001	443	39.8
V17947	1	4.8	0.020	881	46.1
V17958	1	2.3	0.014	273	35.3
V17977	1	2.7	0.060	417	44.6
V18248	1	2.9	0.007	300	72.5
V18538	1	2.3	0.039	1381	34.9
V18539	1	4.7	0.029	356	53.1
V18546	1	1.6	0.014	967	28.9
V18547	1	1.2	0.001	621	22.1
V18550	1	1.0	0.021	605	34.6
V18551	1	2.6	0.019	456	49.9
V18570	1	2.8	0.001	398	30.2
V18612	1	2.2	0.039	265	42.0
V18645	1	2.4	0.054	325	42.0
V19138	1	0.9	0.066	741	35.8
V19728	1	5.4	0.022	841	27.1
V20617	**1**	11.1	0.115	2017	0.0
V21246	1	10.7	0.042	1267	12.8
V21321	1	2.6	0.045	417	32.2
V21913	1	6.6	0.018	366	20.2
V22050	1	6.9	0.017	592	33.0

Table B2 -XPSWMM Existing Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Drainage Area ID	Subcatchment	Area (ac)	Slope (ft/ft)	Width (ft)	Impervious Percent
WE_RU	1	0.2	0.025	58	50.0
WE_RU	2	0.2	0.017	62	41.0

Table B3 -XPSWMM Proposed Conditions Hydrologic Input Parameters
Model: Proposed Conditions with Rate Control Structures
I-35W Corridor Drainage Study
HENNC 113114
Date: 5.14.14
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Table

Name	Subcatchment	Area ac	Slope	Width ft	Impervious Percentage %
22-35W	1	16.0	0.02	2587	51.7
235-0	1	6.5	0.02	195	70.8
24/25-35WA	1	10.8	0.01	195	68.4
24/25-35WB	1	2.5	0.01	116	51.5
24-1st	1	5.1	0.02	1204	47.0
24-3rd	1	5.4	0.02	926	21.9
24-4th	1	3.0	0.03	528	40.8
24-Clin	1	2.1	0.03	419	50.7
24-Nic	1	3.1	0.02	727	75.0
24-Port	1	8.8	0.00	1003	45.0
24-Stev	1	4.0	0.02	1254	19.4
25-1st	1	7.7	0.01	1400	50.5
25-3rd	1	16.4	0.02	2116	71.8
25-4th	1	3.2	0.03	255	39.4
25-5th	1	8.0	0.02	1985	53.3
25-Clin	1	5.7	0.02	2020	41.4
25-Nic	1	2.9	0.02	690	82.9
25-Oak	1	7.7	0.01	1818	65.8
25-Port	1	9.0	0.01	2472	46.3
25-Stev	1	4.0	0.01	1054	82.6
26-1st	1	5.7	0.02	1194	58.0
26-35W	1	5.1	0.03	1429	53.8
26-Bla	1	2.7	0.02	996	58.1
26-Nic	1	7.1	0.02	985	69.7
26-Stev	1	8.3	0.02	1186	54.5
27-1st	1	8.4	0.01	1979	53.5
27-2nd	1	10.1	0.00	2248	47.7
27-35W	1	4.3	0.09	1464	54.8
27-3rd	1	9.0	0.04	1726	48.2
27-4th	1	5.0	0.01	516	95.0
27-5th	1	4.5	0.01	959	50.6
27-Bla	1	11.8	0.01	1856	52.4

Table B3 -XPSWMM Proposed Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Name	Subcatchment	Area ac	Slope	Width ft	Impervious Percentage %
27-Colum	1	1.4	0.01	326	56.9
27-Nic	1	10.9	0.01	1859	78.6
27-Oak	1	3.3	0.01	588	57.8
27-Park	1	2.1	0.01	314	67.4
27-Pils	1	9.9	0.01	2013	47.1
27-Port	1	8.4	0.01	1293	37.4
27-Stev	1	7.5	0.01	1661	46.4
28-1st	1	5.0	0.01	1135	63.2
28-35W	1	4.4	0.10	1542	65.0
28-4th	1	8.3	0.02	838	95.4
28-5th	1	10.5	0.02	1708	65.9
28-Bla	1	5.4	0.01	926	64.9
28-Colum	1	5.7	0.00	1685	73.7
28-Nic	1	5.0	0.01	729	89.9
28-Oak	1	6.1	0.01	1789	54.4
28-Park	1	6.9	0.00	1791	65.9
28-Port	1	5.6	0.01	1018	50.1
28-Stev	1	7.7	0.00	1019	55.0
29-2nd	1	2.0	0.00	202	27.9
29-35W	1	4.2	0.01	2455	93.4
29-3rd	1	3.0	0.00	486	43.1
29-4th	1	2.5	0.02	344	77.9
29-5th	1	16.7	0.04	2576	44.4
29-Bla	1	2.1	0.01	948	49.3
29-Clin	1	2.4	0.00	338	10.7
29-Nic	1	2.3	0.01	888	90.4
29-Pils	1	1.4	0.00	812	51.6
29-Pleas	1	0.7	0.01	133	80.5
29-Port	1	4.3	0.00	507	72.3
2Av-Clin	1	9.1	0.02	427	90.4
35TH_C	1	8.7	0.02	149	56.3
35TH_D	1	2.2	0.02	205	74.8
4_44	1	0.7	0.00	131	55.0
40TH	1	4.5	0.01	157	56.7
42_PL ALL	1	2.5	0.01	271	37.3
42ND	1	13.0	0.02	173	61.0
43_2	1	0.5	0.00	29	70.0
43_3	1	0.6	0.01	96	53.0
43_4	1	1.3	0.00	117	27.0
43_5	1	0.6	0.00	99	74.0
43_CL	1	1.3	0.01	166	56.0
43_PO	1	0.3	0.01	84	70.0
44_2	1	0.4	0.00	25	70.0
44_3	1	0.4	0.02	62	68.0
44_3 ALL1	1	1.7	0.00	165	41.0
44_3 ALL2	1	1.3	0.03	161	31.0

Table B3 -XPSWMM Proposed Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Name	Subcatchment	Area ac	Slope	Width ft	Impervious Percentage %
44_3A	1	2.5	0.00	204	56.0
44_4	1	0.5	0.00	85	72.0
44_4A	1	1.4	0.00	109	58.0
44_5	1	1.9	0.01	118	42.0
44_5A	1	1.4	0.01	118	43.0
44_CL	1	0.5	0.00	87	51.0
44_CL ALL	1	1.3	0.01	236	38.0
44_PO	1	1.6	0.00	117	54.0
44_POA	1	1.9	0.00	143	53.0
45_3	1	0.4	0.03	89	60.0
45_3 ALL	1	1.6	0.02	323	35.0
45_3B	1	1.3	0.00	106	48.0
45_4	1	0.6	0.00	87	59.0
45_5	1	1.3	0.01	120	45.0
45_CL	1	0.5	0.00	89	58.0
45_CL A	1	1.2	0.00	85	52.0
45_PL ALL	1	2.3	0.01	274	31.5
45_PO	1	1.1	0.00	99	54.0
46_2 A	1	0.3	0.03	32	92.0
46_2 ALL	1	1.9	0.02	253	38.0
46_2 ALL1	1	2.0	0.02	377	40.0
46_3	1	1.2	0.00	88	46.0
46_3A	1	2.4	0.00	155	88.0
46_4	1	0.8	0.01	102	66.0
46_4 A	1	0.6	0.00	80	69.0
46_4 ALL	1	2.0	0.00	202	12.0
46_5	1	0.6	0.00	107	76.0
46_5A	1	0.7	0.01	112	34.0
46_CL	1	1.2	0.00	95	66.0
46_CL A	1	1.1	0.00	83	59.0
46_GA ALL	1	2.4	0.02	242	31.0
46_LY ALL	1	2.0	0.02	267	33.5
46_PO	1	1.6	0.00	118	60.0
46_PO A	1	1.9	0.00	123	50.0
46TH-1	1	3.0	0.01	300	95.0
46TH-10	1	1.7	0.01	300	95.0
46TH-11	1	1.5	0.01	300	95.0
46TH-12	1	2.0	0.01	300	95.0
46TH-13	1	2.3	0.01	300	95.0
46TH-14	1	4.1	0.01	300	95.0
46TH-15	1	3.8	0.01	748	30.0
46TH-2	1	1.6	0.01	300	95.0
46TH-3	1	1.3	0.01	300	95.0
46TH-4	1	1.4	0.01	300	95.0
46TH-5	1	3.1	0.01	300	95.0
46TH-6	1	1.1	0.01	300	95.0

Table B3 -XPSWMM Proposed Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Name	Subcatchment	Area ac	Slope	Width ft	Impervious Percentage %
46TH-7	1	3.0	0.01	300	95.0
46TH-8	1	2.4	0.01	300	95.0
46TH-9	1	1.2	0.01	300	95.0
47_2	1	1.4	0.02	105	44.0
47_3	1	0.4	0.01	62	59.0
47_5	1	0.6	0.03	117	56.0
47_CL	1	1.1	0.02	98	51.0
47_CL A	1	0.6	0.02	99	58.0
47_LY ALL	1	2.4	0.00	266	33.3
47_PO	1	0.4	0.01	83	58.0
48_3	1	0.4	0.00	83	60.0
48_4	1	1.2	0.01	86	59.0
48_4 A	1	1.2	0.01	104	58.0
48_5	1	1.3	0.02	95	45.0
48_5 ALL	1	1.7	0.02	151	46.0
48_BL	1	0.4	0.04	66	61.0
48_BL ALL	1	2.9	0.01	276	53.0
48_CL	1	0.9	0.01	114	41.0
48_NI	1	0.3	0.00	47	73.0
48_NIA	1	0.6	0.02	123	71.0
48_PO	1	1.2	0.02	102	58.0
48_PO A	1	1.5	0.01	116	56.0
48_ST	1	0.5	0.05	67	58.0
48_WE	1	0.5	0.03	82	51.0
49_1	1	0.4	0.09	78	49.0
49_2	1	0.5	0.01	36	48.0
49_2 ALL	1	1.7	0.03	223	38.0
49_3	1	1.2	0.02	102	50.0
49_3 A	1	1.2	0.02	96	51.0
49_4	1	1.3	0.02	110	57.0
49_4 A	1	1.1	0.02	94	62.0
49_5	1	1.1	0.02	90	55.0
49_5 ALL	1	1.3	0.02	187	48.0
49_CL	1	1.3	0.03	94	57.0
49_NI	1	4.5	0.03	238	40.0
49_RU ALL2	1	0.6	0.01	381	39.0
49_ST	1	2.8	0.04	181	45.0
49_ST A	1	0.3	0.07	62	33.0
49_WE	1	4.4	0.07	535	33.0
5_43 ALL	1	0.8	0.02	149	45.0
5_46 ALL	1	1.7	0.01	200	47.0
50_1	1	0.4	0.10	96	43.0
50_BE	1	0.2	0.04	40	77.0
50_NI	1	0.5	0.05	66	66.0
50_NI A	1	0.2	0.00	36	75.0
50_ST A	1	0.4	0.07	85	63.0

Table B3 -XPSWMM Proposed Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Name	Subcatchment	Area ac	Slope	Width ft	Impervious Percentage %
51_ST	1	1.1	0.07	120	49.0
B5496	1	1.2	0.01	300	95.0
B5501	1	2.1	0.01	300	95.0
B5573	1	4.8	0.02	230	0.8
BE_50	1	0.4	0.05	68	55.0
BE_61	1	0.4	0.06	127	54.0
C5427	1	1.6	0.01	300	95.0
C5429	1	2.1	0.01	300	95.0
CB NB 55-2	1	9.2	0.01	257	81.3
CB NB 60-2	1	3.3	0.01	312	76.1
CBWB 236-2	1	4.9	0.02	141	53.3
D6172	1	3.3	0.00	668	86.0
D6504	1	0.6	0.02	276	95.0
D6572	1	1.2	0.01	464	68.3
D6616	1	1.1	0.00	175	61.5
D6706	1	1.6	0.01	502	40.0
D6708	1	1.9	0.02	566	69.4
D6720	1	2.1	0.01	524	87.3
D6774	1	1.3	0.01	425	89.3
D6780	1	2.5	0.00	583	52.3
D6813	1	4.5	0.02	1179	60.5
D6844	1	2.4	0.02	441	73.6
D6846	1	2.7	0.01	459	60.3
D6847	1	1.4	0.02	1008	53.6
D6852	1	1.8	0.03	515	75.0
D6853	1	2.5	0.01	639	31.8
D6865	1	0.6	0.05	625	66.1
D6948	1	0.8	0.03	610	67.2
D7121	1	4.2	0.01	833	56.9
D7150	1	4.1	0.02	820	51.9
D7163	1	3.3	0.03	1128	52.2
D7165	1	3.4	0.01	1172	55.2
D7170	1	1.6	0.02	701	60.0
D7176	1	2.5	0.02	227	60.0
D7181	1	2.7	0.01	469	62.7
D7264	1	1.9	0.01	544	53.8
D7436	1	5.5	0.02	999	50.5
D7552	1	4.9	0.01	408	61.9
D7746	1	1.2	0.01	63	77.2
D7886	1	1.5	0.03	998	71.9
DS1(39th)	1	6.9	0.01	181	63.8
DS13	1	22.5	0.02	164	55.6
DS16	1	6.4	0.01	141	50.2
DS6	1	40.6	0.02	1814	58.9
DS7	1	52.8	0.01	3433	51.9
G7893	1	2.8	0.00	405	44.8

Table B3 -XPSWMM Proposed Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Name	Subcatchment	Area ac	Slope	Width ft	Impervious Percentage %
G7903	1	1.0	0.01	142	47.7
G7922	1	3.2	0.00	306	47.1
G7944	1	2.0	0.00	416	42.7
G7955	1	1.1	0.02	280	77.7
G7985	1	1.6	0.04	298	82.8
G8254	1	2.6	0.00	197	50.9
G8255	1	5.5	0.01	830	51.2
G8261	1	3.0	0.02	406	49.8
G8275	1	3.1	0.03	700	17.9
G8276	1	4.2	0.01	687	41.9
G8326	1	1.3	0.01	896	46.6
G8374	1	4.8	0.02	736	74.7
G8380	1	1.4	0.03	758	67.5
G8502	1	1.2	0.07	351	37.7
G8594	1	3.5	0.09	678	51.9
G8611	1	1.9	0.02	704	60.0
G8618	1	1.0	0.01	312	38.3
G8620	1	5.3	0.07	733	61.1
G8710	1	2.8	0.01	423	61.3
G8721	1	1.3	0.05	848	51.6
G8745	1	5.8	0.03	805	54.5
G8765	1	3.5	0.00	632	59.2
G8768	1	2.7	0.03	405	69.8
G8778	1	3.7	0.01	657	56.3
G8783	1	1.1	0.05	913	63.4
G8805	1	1.3	0.04	111	41.3
G8820	1	2.2	0.04	516	60.0
G9139	1	1.8	0.08	416	62.6
G9146	1	4.2	0.05	152	65.2
G9147	1	2.3	0.11	663	60.3
G9155	1	1.9	0.02	1100	82.6
G9165	1	3.6	0.02	396	81.9
G9226	1	4.7	0.03	377	55.3
G9233	1	5.3	0.02	526	72.6
G9270	1	5.2	0.03	358	79.8
G9274	1	8.0	0.01	800	56.7
G9284	1	3.4	0.00	448	81.1
G9288	1	6.1	0.00	358	81.4
G9289	1	2.1	0.02	1308	62.6
I7166	1	7.4	0.00	254	70.9
I7177	1	6.1	0.00	431	60.1
I7312	1	19.6	0.01	1117	94.5
I7336	1	2.6	0.01	312	94.4
I7553	1	2.3	0.01	555	86.2
J10110	1	4.3	0.02	921	48.3
J10190	1	2.5	0.04	1069	39.5

Table B3 -XPSWMM Proposed Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Name	Subcatchment	Area ac	Slope	Width ft	Impervious Percentage %
J10219	1	1.6	0.04	1224	37.4
J10409	1	2.5	0.05	1296	44.9
J10521	1	7.9	0.01	833	47.8
J10533	1	4.8	0.01	391	47.1
J10613	1	6.4	0.00	546	44.3
J10621	1	9.4	0.01	1132	70.5
J10629	1	4.9	0.02	357	45.2
J10632	1	5.0	0.05	638	44.1
J10642	1	4.3	0.02	384	49.6
J11109	1	12.4	0.01	742	55.9
J11159	1	6.0	0.00	508	39.6
J11163	1	7.1	0.01	536	63.4
J11170	1	2.8	0.03	417	37.5
J11176	1	0.7	0.04	653	44.8
J11186	1	6.3	0.01	492	50.8
J11211	1	3.3	0.01	513	42.5
J11226	1	9.2	0.01	672	36.2
J11227	1	9.2	0.01	648	39.7
J11637	1	5.1	0.01	355	41.3
J4567	1	0.8	0.03	751	48.9
J4596	1	2.4	0.00	259	60.0
J4597	1	2.6	0.01	198	45.8
J4734	1	5.6	0.01	750	60.4
J4859	1	4.1	0.01	972	54.7
J4891	1	1.0	0.02	635	60.0
J4937	1	6.3	0.02	1039	90.6
J4977	1	1.1	0.00	769	69.3
J5104	1	1.1	0.02	816	95.0
J5228	1	1.1	0.03	539	42.4
J5236	1	5.5	0.01	648	83.2
J5285	1	5.4	0.02	1052	60.0
J5293	1	3.3	0.02	460	94.8
J5323	1	1.6	0.06	580	39.5
J5516	1	2.6	0.03	822	50.5
J5537	1	4.3	0.02	643	59.3
J5648	1	3.5	0.02	501	83.0
J5683	1	2.6	0.05	652	31.2
J5752	1	4.5	0.02	556	45.1
J5965	1	6.2	0.05	670	33.7
J6011	1	5.1	0.01	773	58.1
J6079	1	6.0	0.02	745	70.7
J6131	1	4.6	0.01	788	36.8
J6164	1	4.0	0.01	338	80.1
J6237	1	1.3	0.03	177	0.0
J6463	1	6.1	0.03	1035	0.0
J6471	1	5.9	0.02	632	38.7

Table B3 -XPSWMM Proposed Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Name	Subcatchment	Area ac	Slope	Width ft	Impervious Percentage %
J6477	1	4.6	0.01	616	62.1
J6483	1	3.5	0.00	495	58.3
J6501	1	4.4	0.03	666	80.8
J6507	1	2.0	0.03	467	60.0
J6517	1	7.6	0.03	657	49.2
J6721	1	5.9	0.03	136	23.2
J6806	1	2.5	0.02	427	60.0
J6811	1	1.8	0.01	85	84.4
J6876	1	3.5	0.01	454	60.2
J6883	1	3.6	0.02	483	64.5
J7000	1	3.7	0.02	1270	30.0
J7009	1	23.1	0.04	2066	0.0
J7027	1	16.6	0.05	1776	58.6
J7032	1	2.4	0.11	448	30.0
J7067	1	2.6	0.11	376	34.3
J7070	1	7.4	0.12	645	86.3
J7361	1	4.6	0.01	452	65.8
J7377	1	7.9	0.05	419	54.8
J7391	1	7.8	0.09	1311	77.9
J7411	1	1.1	0.05	533	31.0
J7425	1	2.6	0.14	392	52.3
J7445	1	1.4	0.03	600	30.5
J7576	1	2.6	0.08	433	78.5
J7609	1	4.0	0.03	293	66.9
J7611	1	2.0	0.02	572	58.3
J7663	1	13.5	0.05	1669	58.1
J7735	1	1.9	0.05	233	60.0
J7774	1	2.3	0.04	867	14.3
J7776	1	2.8	0.01	426	27.2
J7781	1	1.2	0.04	245	33.3
J8085	1	2.3	0.01	584	55.7
J8108	1	2.2	0.02	190	46.9
J8442	1	9.8	0.03	2173	66.8
J8475	1	1.1	0.02	449	42.0
J8558	1	1.4	0.01	496	48.1
J8625	1	3.4	0.27	2057	49.3
J8838	1	3.6	0.07	1168	45.5
J8846	1	1.6	0.02	430	59.6
J8847	1	1.1	0.02	269	55.3
J8863	1	3.4	0.07	500	59.6
J8877	1	1.6	0.02	351	52.6
J9041	1	5.0	0.02	912	60.7
J9162	1	2.0	0.06	458	48.7
J9174	1	1.2	0.00	317	60.0
J9185	1	1.4	0.01	526	60.0
J9190	1	1.9	0.04	412	40.7

Table B3 -XPSWMM Proposed Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Name	Subcatchment	Area ac	Slope	Width ft	Impervious Percentage %
J9461	1	2.6	0.02	1270	60.8
J9797	1	14.5	0.01	1279	66.2
J9802	1	5.1	0.04	381	52.5
J9811	1	4.1	0.00	1474	56.5
J9817	1	6.2	0.02	502	54.6
J9885	1	0.9	0.03	673	62.8
J9920	1	1.8	0.02	1292	49.7
J9923	1	6.4	0.01	532	52.1
J9941	1	5.1	0.03	388	51.0
J9952	1	6.5	0.03	546	45.0
JDOT1	1	5.4	0.02	200	55.5
JDOT2	1	20.7	0.01	663	74.8
JDOT3	1	6.5	0.03	247	89.0
JDOT4	1	5.1	0.04	2490	88.5
JDUNWOODY	1	10.3	0.01	1000	42.0
JMPRB1	1	15.7	0.01	1109	42.5
JMPRB2	1	17.3	0.01	588	50.2
JUNCT	1	14.9	0.01	750	45.9
L14613	1	1.7	0.02	1194	55.2
L14670	1	1.6	0.00	301	63.3
L14678	1	1.6	0.00	337	42.8
L14984	1	4.5	0.01	378	32.8
L14989	1	8.2	0.01	170	44.4
L15000	1	4.6	0.01	381	35.4
L15005	1	4.9	0.01	392	38.8
L15012	1	8.4	0.01	647	47.2
L15417	1	1.2	0.02	360	46.8
L15533	1	2.3	0.01	170	95.9
L15577	1	5.4	0.00	851	33.8
L15581	1	4.7	0.00	377	35.1
L15587	1	1.4	0.04	1055	35.4
L15588	1	5.2	0.00	406	38.0
L15596	1	2.9	0.00	549	51.8
L15605	1	4.3	0.00	402	41.5
L15854	1	2.0	0.02	787	52.3
L15862	1	10.8	0.01	1126	46.6
L15870	1	6.5	0.01	492	38.5
L16086	1	2.0	0.00	322	43.3
L16228	1	2.1	0.01	231	41.8
L16318	1	0.7	0.01	613	40.5
Lake-2nd	1	2.3	0.02	367	47.4
Lake-3rd	1	1.6	0.00	634	68.5
Lake-4th	1	6.4	0.00	1388	81.0
Lake-Clin	1	5.6	0.01	1395	64.4
LORINGPK	1	2.6	0.01	382	58.0
M13902	1	1.1	0.01	244	30.0

Table B3 -XPSWMM Proposed Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Name	Subcatchment	Area ac	Slope	Width ft	Impervious Percentage %
M13907	1	1.1	0.03	308	44.8
M14298	1	5.2	0.00	560	66.6
M14368-1	1	5.8	0.00	597	54.2
M14368-2	1	1.1	0.00	597	85.0
M14370	1	3.6	0.01	746	94.9
M14371	1	8.6	0.00	381	95.0
M14578	1	3.3	0.01	414	46.5
M14695	1	2.4	0.01	498	89.6
M14714	1	2.5	0.01	558	95.0
M15022	1	10.5	0.01	610	74.7
M15027	1	5.5	0.01	475	75.9
M15041	1	10.4	0.00	831	73.9
M15102	1	11.3	0.01	828	49.5
M15119	1	7.6	0.00	756	61.2
MH R5 37-1	1	3.0	0.02	66	34.0
MH SB 32-2	1	5.4	0.01	196	82.9
MH SB 38-3	1	4.4	0.02	204	68.6
MHLN81-3	1	5.3	0.04	624	60.2
N16989	1	5.3	0.01	415	42.0
N17001	1	5.5	0.01	407	32.4
N17019	1	4.6	0.01	452	35.8
NI_RU	1	1.4	0.04	104	51.0
O17590	1	5.3	0.02	976	40.9
O17593	1	1.5	0.05	1282	38.2
O17608	1	4.7	0.02	380	36.6
O17636	1	6.8	0.02	837	43.0
O17675	1	8.0	0.02	387	46.2
O17695	1	4.4	0.02	401	34.4
O17993	1	2.1	0.02	932	38.8
O18000	1	2.2	0.02	283	30.6
O18169	1	4.0	0.01	49	39.8
O18174	1	9.6	0.01	1346	34.9
O18178	1	14.0	0.01	1113	38.3
O18191	1	5.1	0.01	645	32.0
O18192	1	4.6	0.01	174	35.6
O18197	1	3.2	0.01	70	40.8
O18600	1	2.2	0.03	251	32.8
O18618	1	2.3	0.01	310	32.3
O18777	1	1.7	0.01	246	40.5
O18907	1	7.7	0.02	1305	32.0
O18928	1	2.2	0.05	1176	41.2
O18930	1	2.3	0.02	1039	42.1
O18941	1	0.6	0.06	259	32.5
O19212	1	1.1	0.03	380	34.2
O19213	1	6.9	0.01	709	58.3
O19440	1	2.3	0.06	1207	35.8

Table B3 -XPSWMM Proposed Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Name	Subcatchment	Area ac	Slope	Width ft	Impervious Percentage %
O19446	1	1.4	0.02	1300	39.6
O19455	1	1.6	0.02	1329	69.3
P16324	1	0.7	0.06	634	32.8
P16380	1	1.8	0.01	358	56.9
P16521	1	1.1	0.03	787	55.5
P16672	1	1.6	0.01	1007	53.4
P16727	1	3.4	0.02	586	54.7
P17018	1	1.1	0.04	816	39.4
P17026	1	5.1	0.01	394	37.5
P17032	1	4.9	0.01	361	45.6
P17041	1	1.2	0.02	864	44.9
P17051	1	1.9	0.02	1090	54.4
P17061	1	9.0	0.02	1110	47.8
P17272	1	2.1	0.04	503	49.2
P17357	1	3.6	0.02	446	32.6
P17696	1	8.1	0.01	688	36.3
P17699	1	7.1	0.01	596	38.2
P17718	1	8.4	0.02	671	46.5
P17719	1	2.2	0.02	1191	53.0
P17735	1	1.9	0.03	724	31.8
P17745	1	6.8	0.01	519	33.7
P17754	1	1.2	0.05	684	40.2
P17755	1	1.7	0.02	1297	31.8
P17801	1	1.0	0.03	656	34.0
P17912	1	1.9	0.01	1208	35.9
P17914	1	6.8	0.01	817	40.6
P17950	1	3.1	0.01	285	37.1
P17959	1	3.6	0.02	418	34.5
P17987	1	2.2	0.02	297	49.9
P18143	1	1.2	0.02	633	34.7
P18247	1	0.9	0.03	622	39.3
P18270	1	2.7	0.02	422	39.8
P18338	1	6.0	0.01	1184	30.4
P18354	1	4.8	0.01	502	35.1
P18411	1	7.7	0.01	569	34.8
P18426	1	9.2	0.01	636	44.3
P18434	1	10.9	0.01	598	37.4
P18442	1	8.8	0.01	681	37.5
P18451	1	10.1	0.01	659	37.5
P18454	1	9.4	0.01	668	42.0
P18460	1	6.9	0.01	556	48.6
P18479	1	1.8	0.02	1218	36.9
P18510	1	2.7	0.03	1171	54.9
P18603	1	2.4	0.01	265	42.4
P18658	1	2.9	0.01	510	32.4
P18671	1	2.4	0.03	390	35.4

Table B3 -XPSWMM Proposed Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Name	Subcatchment	Area ac	Slope	Width ft	Impervious Percentage %
P18943	1	4.1	0.02	1495	34.6
P18950	1	2.4	0.01	324	33.3
P19021	1	2.5	0.02	456	38.3
P19070	1	3.4	0.01	684	40.3
P19101	1	0.9	0.01	671	38.1
P19144	1	0.7	0.02	656	43.2
P19147	1	0.7	0.01	594	54.0
P19148	1	0.7	0.02	660	39.1
P19214	1	3.2	0.03	381	33.6
R1	1	1.2	0.03	235	30.7
R113	1	9.2	0.02	791	31.7
R127	1	4.9	0.03	363	34.9
R130	1	5.2	0.02	377	32.2
R136	1	13.8	0.02	1156	39.4
R14	1	0.6	0.08	289	32.0
R142	1	5.1	0.01	592	30.5
R144	1	1.5	0.02	1296	30.5
R172	1	1.4	0.07	300	30.2
R175	1	4.8	0.03	1684	36.2
R194	1	9.2	0.03	1895	30.5
R197	1	4.5	0.02	358	30.1
R201	1	3.3	0.02	404	27.8
R206	1	3.1	0.03	472	23.1
R233	1	2.0	0.04	261	30.4
R242	1	5.1	0.01	1281	30.2
R255	1	3.7	0.02	397	32.4
R258	1	2.6	0.01	420	31.7
R260	1	5.3	0.02	348	32.0
R263	1	4.6	0.05	919	1.0
R266	1	4.6	0.02	372	31.9
R50	1	4.9	0.01	372	37.3
R51	1	2.2	0.06	1107	43.2
R53	1	2.8	0.02	431	32.0
R54	1	18.2	0.03	1256	15.2
R56	1	5.0	0.02	385	36.2
R61	1	5.1	0.02	381	37.4
R69	1	5.1	0.03	379	35.2
R70	1	3.0	0.02	387	34.1
R78	1	3.8	0.05	398	31.5
R8	1	2.2	0.01	77	34.4
R9	1	0.7	0.02	652	39.3
R93	1	1.2	0.05	411	33.9
R95	1	1.8	0.05	275	30.5
RU	1	3.5	0.01	482	47.0
SouthPondA	1	7.9	0.01	311	77.1
SouthPondB	1	1.9	0.01	295	42.2

Table B3 -XPSWMM Proposed Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Name	Subcatchment	Area ac	Slope	Width ft	Impervious Percentage %
ST_49 F	1	0.8	0.08	93	48.0
ST_RU	1	0.6	0.04	50	51.0
T19194	1	0.7	0.04	625	37.7
T19291	1	1.5	0.01	369	35.1
T19316	1	1.0	0.01	283	46.3
T19491	1	1.4	0.01	577	36.8
T19507	1	1.0	0.04	752	35.0
T19510	1	0.7	0.05	674	40.6
T19513	1	3.3	0.02	904	52.2
T19643	1	2.2	0.02	666	63.3
T19678	1	6.5	0.01	501	46.4
T19696	1	7.5	0.00	598	46.5
T19703	1	7.3	0.00	586	36.7
T19705	1	7.7	0.00	620	31.7
T19708	1	10.2	0.00	660	36.1
T19714	1	6.5	0.00	517	32.1
T19716	1	8.6	0.00	636	40.3
T19718	1	2.0	0.05	1245	32.5
T19825	1	8.5	0.02	1181	34.7
T19878	1	3.5	0.01	407	37.9
T19918	1	1.5	0.02	948	34.7
T19946	1	2.4	0.01	304	49.8
T20349	1	6.4	0.02	619	41.3
T20452	1	6.3	0.00	487	35.5
T20463	1	3.4	0.00	604	34.8
T20468	1	1.2	0.01	103	33.5
T20473	1	5.0	0.02	388	36.6
T20481	1	7.1	0.00	554	39.3
T20499	1	5.9	0.00	611	34.5
T20511	1	5.2	0.01	361	35.3
T20520	1	5.5	0.00	480	31.0
T20531	1	4.9	0.01	383	43.6
T20551	1	1.8	0.03	237	28.0
T20714	1	3.0	0.02	492	36.2
T20738	1	4.2	0.01	610	38.2
T20761	1	2.6	0.01	402	31.6
T20831	1	1.2	0.00	250	30.0
T21001	1	6.1	0.03	790	32.9
T21168	1	4.9	0.04	762	30.7
T21175	1	5.2	0.03	533	31.8
T21176	1	2.6	0.03	1227	32.7
T21262	1	4.4	0.01	397	30.9
T21280	1	4.1	0.02	389	32.1
T21291	1	5.1	0.02	378	31.3
T21296	1	2.3	0.05	1308	33.2
T21299	1	5.3	0.03	969	35.5

Table B3 -XPSWMM Proposed Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Name	Subcatchment	Area ac	Slope	Width ft	Impervious Percentage %
T21305	1	5.0	0.02	388	30.8
T21320	1	5.3	0.01	388	34.4
T22072	1	5.0	0.01	1269	34.4
T22077	1	0.7	0.05	665	30.0
T22082	1	4.9	0.01	380	30.6
T22083	1	1.9	0.00	446	42.7
T22090	1	0.7	0.06	659	30.0
T22096	1	2.9	0.02	1121	32.3
T22233	1	2.6	0.01	294	30.0
T22263	1	2.6	0.02	227	35.6
T22683	1	0.8	0.02	673	55.6
T22812	1	3.0	0.02	406	30.0
T22824	1	4.5	0.01	641	31.7
T22962	1	2.1	0.01	271	37.3
T23434	1	7.2	0.01	598	31.1
T23563	1	5.3	0.01	635	32.2
T23794	1	1.8	0.05	574	31.2
T24297	1	0.8	0.02	425	37.7
T24319	1	0.4	0.04	324	30.0
T24331	1	0.8	0.01	622	31.2
T99991	1	3.8	0.04	1000	57.5
T99992	1	4.2	0.06	1100	36.0
U20747	1	1.9	0.01	1184	57.0
U20795	1	2.9	0.02	267	53.5
U21092	1	1.1	0.02	1199	42.3
U21149	1	8.0	0.02	1185	28.7
U21211	1	5.3	0.01	294	25.5
U21230	1	5.2	0.03	253	30.5
U21809	1	4.5	0.01	802	30.9
U21949	1	4.5	0.04	422	27.5
U21973	1	3.4	0.02	389	31.0
U22005	1	1.1	0.03	588	30.0
U22192	1	2.3	0.02	347	30.8
U22485	1	7.6	0.05	1104	0.0
U22511	1	2.6	0.01	567	31.2
U22515	1	2.9	0.05	1156	10.4
U22569	1	4.6	0.01	431	27.4
U22587	1	4.9	0.01	396	41.5
U22606	1	1.3	0.06	584	30.0
U22634	1	2.4	0.01	439	31.7
U22749	1	2.1	0.05	1316	30.3
U22817	1	7.9	0.02	758	30.2
U22942	1	1.2	0.01	353	35.5
U22992	1	2.7	0.03	355	36.6
U23429	1	3.3	0.02	359	32.3
U23442-1	1	3.2	0.01	377	45.8

Table B3 -XPSWMM Proposed Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Name	Subcatchment	Area ac	Slope	Width ft	Impervious Percentage %
U23442-2	1	1.6	0.02	171	45.8
U23453	1	4.2	0.01	397	60.9
U23480	1	5.1	0.02	405	31.7
U23502	1	5.3	0.02	385	31.1
U23526	1	6.1	0.02	577	32.7
U23539	1	7.3	0.02	553	31.3
U23733-1	1	2.2	0.01	727	32.2
U23733-2	1	2.1	0.01	727	32.2
U23765	1	2.7	0.05	417	33.5
U23790	1	1.0	0.01	328	30.0
U24127	1	2.0	0.01	452	30.0
U24165	1	0.7	0.01	634	58.6
U24190	1	5.5	0.01	394	57.4
U24206-1	1	4.8	0.01	558	31.4
U24206-2	1	2.2	0.07	347	31.4
U24237	1	4.6	0.06	841	31.1
U24254	1	1.4	0.01	210	31.6
U24793	1	15.1	0.02	1355	34.6
U24812	1	9.5	0.01	661	46.4
U24837	1	2.8	0.07	1059	31.7
U24876	1	5.9	0.01	586	33.3
U24884	1	5.1	0.01	371	30.0
U24889	1	7.6	0.01	583	33.7
U24890	1	0.2	0.08	193	30.0
U24901	1	2.2	0.05	1334	30.5
U24908	1	4.9	0.04	678	30.8
U24935	1	13.3	0.01	1231	33.0
U24966	1	2.9	0.02	369	30.6
U24987	1	2.6	0.02	389	30.5
U25002	1	2.4	0.02	330	31.4
U25262	1	4.2	0.02	603	30.9
U25290	1	3.1	0.02	398	35.1
U25301	1	0.8	0.02	689	52.9
U25314	1	0.9	0.04	624	37.4
U25327	1	2.7	0.02	1193	30.0
U25330	1	2.5	0.00	1097	30.8
U25374	1	2.7	0.01	417	43.0
U25390	1	2.9	0.01	422	36.1
U25401	1	0.7	0.05	650	42.0
U25403	1	0.8	0.01	638	30.7
U25410	1	5.2	0.02	382	32.7
U25437	1	4.6	0.02	987	32.0
U25490	1	2.8	0.02	289	63.3
U25559	1	2.2	0.02	253	30.5
U25863	1	5.1	0.04	569	30.0
U25888	1	1.7	0.03	1229	44.5

Table B3 -XPSWMM Proposed Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Name	Subcatchment	Area ac	Slope	Width ft	Impervious Percentage %
U25890	1	6.7	0.01	538	36.6
U25895	1	2.5	0.02	459	53.2
U25936	1	6.9	0.01	562	31.4
U25955	1	6.9	0.02	531	31.3
U25965	1	9.1	0.02	684	30.7
U25976	1	9.6	0.02	649	33.5
U25981	1	7.3	0.01	573	39.6
U25991	1	7.0	0.01	547	31.0
U25998	1	6.5	0.02	568	34.2
U26020	1	5.2	0.03	369	35.3
U26029	1	4.9	0.02	283	30.4
U26106	1	2.5	0.04	245	30.5
U26127	1	2.4	0.02	300	31.4
U26487	1	0.8	0.01	633	25.4
U26521	1	4.7	0.07	382	33.9
U26556	1	5.1	0.04	394	27.2
U26560	1	3.5	0.02	369	30.1
U26563	1	4.9	0.03	409	31.1
U26570	1	5.4	0.01	370	30.0
U26585	1	4.9	0.04	917	31.4
U26704	1	2.4	0.09	303	11.9
U27025	1	4.1	0.01	816	60.0
U27229	1	2.9	0.06	646	30.1
U27399	1	3.1	0.05	543	43.7
U27577	1	7.3	0.04	1034	34.1
U27793	1	4.3	0.05	827	35.2
V13912	1	0.7	0.00	367	32.9
V13967	1	2.6	0.01	1044	84.4
V14356-1	1	4.2	0.00	645	54.8
V14356-2	1	4.2	0.00	645	54.8
V14497	1	2.3	0.03	447	79.5
V14500-1	1	4.8	0.00	596	67.6
V14500-2	1	2.3	0.00	596	67.6
V14521-1	1	3.8	0.01	475	75.1
V14521-2	1	1.2	0.01	475	75.1
V14625	1	2.1	0.00	336	58.7
V15134	1	4.3	0.00	943	75.7
V15144	1	0.8	0.01	654	51.3
V15177	1	5.2	0.00	387	54.4
V15211	1	6.0	0.00	1086	42.9
V15388	1	1.8	0.01	288	43.8
V15871	1	5.3	0.00	399	44.8
V15885	1	2.2	0.02	1288	48.5
V15889	1	4.5	0.00	447	36.9
V15898	1	7.7	0.01	578	44.8
V15900	1	9.2	0.01	675	41.8

Table B3 -XPSWMM Proposed Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Name	Subcatchment	Area ac	Slope	Width ft	Impervious Percentage %
V15943	1	4.5	0.00	424	36.8
V16087	1	2.4	0.03	1349	34.1
V16160	1	2.3	0.01	289	58.0
V16563	1	3.2	0.00	576	49.1
V16565	1	8.1	0.00	632	42.0
V16568	1	7.3	0.00	597	35.9
V16572	1	3.0	0.01	473	33.7
V16577	1	4.8	0.01	382	36.1
V16578	1	11.1	0.01	1276	27.0
V16582	1	1.6	0.04	1102	38.0
V16583	1	4.8	0.01	392	35.8
V16589	1	4.5	0.01	382	31.6
V17049	1	7.7	0.00	833	38.7
V17147	1	3.9	0.01	379	36.0
V17150	1	4.7	0.01	390	36.8
V17153	1	3.4	0.01	414	32.8
V17170	1	2.8	0.00	403	41.9
V17182	1	5.1	0.00	381	42.7
V17218	1	7.3	0.01	808	39.3
V17219	1	3.1	0.04	1006	52.5
V17295	1	3.2	0.01	506	37.7
V17346	1	4.1	0.01	564	59.1
V17354	1	2.3	0.01	278	58.9
V17785	1	2.1	0.02	502	39.7
V17827	1	1.1	0.01	598	34.6
V17828	1	1.4	0.02	454	41.3
V17831	1	11.7	0.05	2432	43.5
V17840	1	3.9	0.01	305	33.4
V17846	1	12.3	0.01	1203	48.7
V17863	1	0.8	0.01	654	39.0
V17870	1	0.9	0.00	595	62.5
V17875	1	2.5	0.01	447	49.2
V17884	1	2.8	0.00	443	39.8
V17947	1	4.8	0.02	881	46.1
V17958	1	2.3	0.01	273	35.3
V17977	1	2.7	0.06	417	44.6
V18248	1	2.9	0.01	300	72.5
V18538	1	2.3	0.04	1381	34.9
V18539	1	4.7	0.03	356	53.1
V18546	1	1.6	0.01	967	28.9
V18547	1	1.2	0.00	621	22.1
V18550	1	1.0	0.02	605	34.6
V18551	1	2.6	0.02	456	49.9
V18570	1	2.8	0.00	398	30.2
V18612	1	2.2	0.04	265	42.0
V18645	1	2.4	0.05	325	42.0

Table B3 -XPSWMM Proposed Conditions Hydrologic Input Parameters
I-35W Corridor Drainage Study

Name	Subcatchment	Area ac	Slope	Width ft	Impervious Percentage %
V19138	1	0.9	0.07	741	35.8
V19728	1	5.4	0.02	841	27.1
V20617	1	11.1	0.12	2017	0.0
V21246	1	10.7	0.04	1267	12.8
V21321	1	2.6	0.05	417	32.2
V21913	1	6.6	0.02	366	20.2
V22050	1	6.9	0.02	592	33.0
WE_RU	1	0.2	0.03	58	50.0

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study
HENNC 113114
Model: 2014 Existing Conditions (Atlas 14)
Date: 7.3.14
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Tables

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
755.1	DS2(35th)	DS3(31ST)	2501	0.014	745.7	743.1	Circular	12.00
854.1	235-0	232-0	300	0.014	843.5	837.8	Circular	2.75
5745.1	35TH_D	35TH_C	300	0.012	836.6	834.2	Circular	1.50
5745.2	35TH_D	35TH_C	300	0.014	843.3	840.9	Natural	0.50
5747.1	35TH_C	220-0	250	0.014	834.0	832.0	Circular	1.75
5747.2	35TH_C	220-0	250	0.015	840.9	838.9	Natural	0.50
5751.1	220-0	224-0	420	0.014	827.0	824.6	Circular	2.00
5751.2	220-0	224-0	420	0.015	838.9	836.7	Natural	0.50
5756.1	224-0	DS2(35th)	450	0.014	824.2	821.5	Circular	2.50
5756.2	224-0	DS2(35th)	450	0.015	836.7	840.1	Natural	0.50
5759.1	MH SB 32-2	MH SB 32-4	50	0.014	836.0	835.7	Circular	2.50
5759.2	MH SB 32-2	MH SB 32-4	50	0.015	851.2	846.3	Natural	0.50
5762.1	MH SB 32-4	MH SB 35-1	254	0.014	835.7	834.2	Circular	2.50
5762.2	MH SB 32-4	MH SB 35-1	254	0.015	846.3	844.1	Natural	0.50
5764.1	MH SB 35-1	MH SB 38-3	280	0.014	832.0	829.8	Circular	2.50
5764.2	MH SB 35-1	MH SB 38-3	280	0.015	844.1	845.5	Natural	0.50
5765.1	MH SB 38-3	DS15	290	0.014	829.8	826.9	Circular	2.50
5765.2	MH SB 38-3	DS15	290	0.014	845.5	845.0	Natural	0.50
5768.1	MH R5 37-1	MH R5 39-1	258	0.014	816.1	814.0	Circular	3.00
5768.2	MH R5 37-1	MH R5 39-1	258	0.015	837.9	835.5	Natural	1.00
5770.1	MH R5 39-1	MH 2030	214	0.014	814.0	812.3	Circular	3.00
5770.2	MH R5 39-1	MH 2030	214	0.015	835.5	827.3	Natural	1.00
5773.1	MH 2030	MH NB 43-3	160	0.014	811.5	808.8	Circular	3.00
5773.2	MH 2030	MH NB 43-3	160	0.015	827.3	835.5	Natural	1.00
5778.1	CBWB 236-2	CBWB 238-2	250	0.014	821.7	816.7	Circular	1.50
5778.2	CBWB 236-2	CBWB 238-2	250	0.015	826.3	821.1	Natural	1.00
5780.1	CBWB 239-2	CBWB 239-4	50	0.014	814.8	814.4	Circular	2.00
5780.2	CBWB 239-2	CBWB 239-4	50	0.015	821.0	821.2	Natural	1.00
5781.1	CBWB 239-4	MH 2030	166	0.014	814.4	813.1	Circular	2.00
5781.2	CBWB 239-4	MH 2030	166	0.015	821.2	827.3	Natural	1.00
5784.1	CBWB 238-2	CBWB 239-2	50	0.014	816.7	815.7	Circular	1.50
5784.2	CBWB 238-2	CBWB 239-2	50	0.015	821.1	821.0	Natural	1.00
5787.1	CB NB 60-2	CB NB 58-4	184	0.014	825.4	824.3	Circular	1.50

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
5787.2	CB NB 60-2	CB NB 58-4	184	0.015	830.7	830.9	Natural	1.00
5789.1	CB NB 58-4	MH NB 58-3	50	0.014	824.1	823.8	Circular	1.50
5789.2	CB NB 58-4	MH NB 58-3	50	0.015	830.9	830.2	Natural	1.00
5793.1	MH NB 57-1	CB NB 55-2	200	0.014	822.2	821.0	Circular	2.50
5793.2	MH NB 57-1	CB NB 55-2	200	0.015	830.2	831.0	Natural	1.00
5795.1	CB NB 55-2	CB NB 52-2	250	0.014	820.8	819.5	Circular	2.75
5795.2	CB NB 55-2	CB NB 52-2	250	0.015	831.0	832.5	Natural	1.00
5797.1	CB NB 52-2	MH NB 50-1	200	0.014	819.5	818.5	Circular	2.75
5797.2	CB NB 52-2	MH NB 50-1	200	0.015	832.5	834.1	Natural	1.00
5799.1	MH NB 50-1	CB NB 49-2	100	0.014	818.5	818.0	Circular	3.00
5799.2	MH NB 50-1	CB NB 49-2	100	0.015	834.1	834.3	Natural	1.00
5800.1	CB NB 49-2	MH NB 45-1	400	0.014	817.8	815.8	Circular	3.00
5800.2	CB NB 49-2	MH NB 45-1	400	0.015	834.3	836.8	Natural	1.00
5802.1	MH NB 58-3	MH NB 57-4	48	0.014	823.3	823.0	Circular	2.00
5802.2	MH NB 58-3	MH NB 57-4	48	0.015	830.2	830.2	Natural	1.00
5803.1	MH NB 57-4	MH NB 57-1	66	0.014	823.0	822.7	Circular	2.00
5803.2	MH NB 57-4	MH NB 57-1	66	0.015	830.2	830.2	Natural	1.00
5806.1	MH NB 45-1	MH NB 43-3	190	0.014	815.8	814.8	Circular	3.00
5806.2	MH NB 45-1	MH NB 43-3	190	0.015	836.8	835.5	Natural	1.00
5807.1	MH NB 43-3	DS16	42	0.014	798.2	798.0	Circular	4.50
5807.2	MH NB 43-3	DS16	42	0.015	835.5	810.9	Natural	1.00
12 45_PL	45_PL ALL	45_PL ALL2	159	0.014	871.6	870.8	Circular	1.25
12 49RUB	49_RU ALL2	U26773	170	0.014	892.1	890.3	Circular	1.00
12" 45_PO	45_PO	45_5	269	0.013	831.0	829.5	Circular	1.00
12" 4_44	4_44	44_4A	163	0.013	831.3	830.0	Circular	1.00
12" 47_PO	47_PO	47_5	273	0.013	831.2	829.4	Circular	1.00
12" 48_3	48_3	48_CL	332	0.013	848.2	844.9	Circular	1.00
12" 48_4	48_4	48_4 A	93	0.013	835.3	832.5	Circular	1.00
12" 48_CL	48_CL	48_4	326	0.013	844.9	835.3	Circular	1.00
12" 48_POA	48_PO A	48_PO	70	0.013	826.4	825.8	Circular	1.00
12" 49_PLM	49_PL MID	49_WE	293	0.013	892.9	892.6	Circular	1.00
12" 49_WE.	49_WE	49_WE MID	312	0.013	891.3	889.3	Circular	1.00
12" 49_WEM	49_WE MID	49_NI	364	0.013	889.3	878.7	Circular	1.00
12" 50_1	50_1	50_ST	292	0.013	908.2	884.7	Circular	1.00
12" 50_BE	50_BE	50_NI	306	0.013	909.9	897.3	Circular	1.00
12" 50_NI	50_NI	50_NI A	53	0.013	897.1	896.1	Circular	1.00
12" 50_ST	50_ST	50_ST A	51	0.013	884.7	882.9	Circular	1.00
12" 51_ST	51_ST	50_ST A	511	0.013	888.4	883.1	Circular	1.00
12" BE_50	BE_50	50_BE	44	0.013	912.3	909.9	Circular	1.00
12" BE_61	BE_61	BE_50	515	0.013	916.0	912.3	Circular	1.00
12" EAST	N509	N510	21	0.013	866.8	866.8	Circular	1.00
12" NI_RU	NI_RU	48_NI	222	0.013	866.2	860.9	Circular	1.00
12" RU.1	RU	RU_WE	173	0.013	886.6	885.7	Circular	1.00
12" RU_WE	RU_WE	48_WE	383	0.013	885.5	874.8	Circular	1.00
12" WE_RU	WE_RU	RU_WE	92	0.013	889.6	888.1	Circular	1.00
12" WEST	N509	N510	21	0.013	866.8	866.8	Circular	1.00
15 43_PI	U23733-2	U23515	105	0.013	859.4	858.8	Circular	1.25

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
15" 44_POA	44_POA	44_PO	68	0.013	829.7	829.5	Circular	1.25
15" 48_4A	48_4 A	48_5	275	0.013	830.6	826.4	Circular	1.25
15" 48_BL	48_BL	48_BL MID	189	0.013	860.8	860.0	Circular	1.25
15" 48_BLM	48_BL MID	48_NI	172	0.013	860.0	859.3	Circular	1.25
15" 48_WE	48_WE	48_BL	304	0.013	873.3	860.8	Circular	1.25
15" 49_1.1	49_1	49_ST	329	0.013	854.8	840.8	Circular	1.25
15" 49_NI	49_NI	49_1	309	0.013	878.7	854.8	Circular	1.25
15" 49_ST.	49_ST	49_ST A	27	0.013	840.8	839.0	Circular	1.25
15" 50_NIA	50_NI A	49_NI	488	0.013	896.1	881.2	Circular	1.25
15" 50_STA	50_ST A	50_ST B	186	0.013	881.9	871.1	Circular	1.25
15" 50_STB	50_ST B	ST_49 F	209	0.013	870.6	857.1	Circular	1.25
15" ST_49F	ST_49 F	49_ST E	206	0.013	856.3	843.5	Circular	1.25
18 42_PL	42_PL ALL	T22803	187	0.013	870.6	870.1	Circular	1.50
18" 46_PO	46_PO	46_PO A	62	0.013	830.3	829.7	Circular	1.50
18" 48_1	48_1	48_ST	290	0.013	856.3	850.8	Circular	1.50
18" 48_NI	48_NI	48_NIA	86	0.013	859.3	857.3	Circular	1.50
18" 48_NIA	48_NIA	48_1	287	0.013	857.3	856.3	Circular	1.50
18" 49_STE	49_ST E	49_ST A	35	0.013	842.7	840.7	Circular	1.50
18" N510	N510	T23544	12	0.013	872.0	872.0	Circular	1.50
21" 43_PO	43_PO	43_5	249	0.013	831.2	830.2	Circular	1.75
21" 44_2	44_2	44_3 MID	180	0.013	835.3	833.5	Circular	1.75
21" 44_3	44_3	44_3A	43	0.013	832.5	831.2	Circular	1.75
21" 44_3M	44_3 MID	44_3	123	0.013	833.5	832.5	Circular	1.75
21" 48_5M	48_5 MID	48_5	140	0.013	825.8	825.3	Circular	1.75
21" 48_PO	48_PO	48_5 MID	123	0.013	826.3	825.8	Circular	1.75
21" 48_ST	48_ST	ST_RU	365	0.013	850.8	844.3	Circular	1.75
21" 49_STB	49_ST B	49_ST A	24	0.013	839.3	839.0	Circular	1.75
21" 49_STC	49_ST C	49_ST B	24	0.013	840.7	839.3	Circular	1.75
21" ST_RU	ST_RU	49_ST C	268	0.013	844.3	840.7	Circular	1.75
24 46_LY	46_LY ALL	U25405	301	0.014	868.8	867.9	Circular	1.00
24" 44_3A	44_3A	44_CL	314	0.013	831.2	830.3	Circular	2.00
24" 44_BL	44_BL ALL	U24201	277	0.014	847.9	846.5	Circular	2.00
24" 44_PO	44_PO	44_5A	282	0.013	829.3	828.9	Circular	2.00
27" 44_CL	44_CL	44CL_MID	161	0.013	830.3	830.1	Circular	2.25
27" 44CL_M	44CL_MID	44_4	141	0.013	830.1	829.9	Circular	2.25
27" 45_2	45_2	45_3	240	0.013	836.5	831.8	Circular	2.25
27" 45_3	45_3	45_3 A	40	0.013	831.8	831.6	Circular	2.25
27" 45_3A	45_3 A	45_3B	9	0.013	831.6	831.2	Circular	2.25
27" 46_2A	46_2 A	46_2 MID	126	0.013	832.9	832.1	Circular	2.25
27" 46_2M	46_2 MID	46_MID A	45	0.013	832.1	831.7	Circular	2.25
27" 46_MA	46_MID A	46_3	83	0.013	831.7	831.1	Circular	2.25
30" 43_2	43_2	43_3	289	0.013	833.2	832.3	Circular	2.50
30" 43_3	43_3	43_CL	355	0.013	832.3	831.3	Circular	2.50
30" 44_4	44_4	44_4A	40	0.013	829.9	829.8	Circular	2.50
30" 44_4A	44_4A	44_5 B	310	0.013	829.8	828.9	Circular	2.50
30" 44_5 B	44_5 B	44_5A	16	0.013	828.9	828.3	Circular	2.50
30" 45_3B	45_3B	45_3 C	13	0.013	831.2	830.6	Circular	2.50

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
30" 45_3C	45_3 C	45_3 MID	150	0.013	830.6	830.2	Circular	2.50
30" 45_3M	45_3 MID	45_CL	142	0.013	830.2	829.8	Circular	2.50
30" 45_CL	45_CL	45_CL A	32	0.013	829.8	829.7	Circular	2.50
30" 45_CLA	45_CL A	45_4	350	0.013	829.7	828.3	Circular	2.50
30" 46_3	46_3	46_3A	78	0.013	831.1	830.5	Circular	2.50
30" 46_3A	46_3A	46_CL	281	0.013	830.5	828.3	Circular	2.50
30" 46_POA	46_PO A	46_5A	295	0.013	829.7	826.3	Circular	2.50
30" 49_2	49_2	49_2 MID	188	0.013	837.0	835.6	Circular	2.50
30" 49_2M	49_2 MID	49_3	131	0.013	835.6	834.6	Circular	2.50
30" 49_3	49_3	49_3 A	69	0.013	834.6	834.3	Circular	2.50
30" 49_3A	49_3 A	49_CL	278	0.013	834.3	825.3	Circular	2.50
33" 43_4	43_4	43_5	371	0.013	830.3	829.1	Circular	2.75
33" 43_CL	43_CL	43_4	329	0.013	831.3	830.3	Circular	2.75
33" 45_4	45_4	45_5	314	0.013	828.3	827.3	Circular	2.75
33" 46_4	46_4	46_4 A	39	0.013	827.9	827.6	Circular	2.75
33" 46_CL	46_CL	46_CL A	32	0.013	828.3	828.3	Circular	2.75
33" 46_CLA	46_CL A	46_4	294	0.013	828.3	827.9	Circular	2.75
33" 49_4	49_4	49_4 A	31	0.013	823.8	823.7	Circular	2.75
33" 49_CL	49_CL	49_4	327	0.013	825.3	823.8	Circular	2.75
35W100.1	46TH-10	46TH-9	240	0.014	840.1	838.9	Circular	3.00
35W100.2	46TH-10	46TH-9	240	0.015	847.6	846.4	Natural	0.50
35W101.1	46TH-9	C5400	195	0.014	838.3	837.4	Circular	3.00
35W101.2	46TH-9	C5400	195	0.015	846.4	845.5	Natural	0.50
35W102.1	C5400	B5339	50	0.014	837.4	837.1	Circular	3.00
35W102.2	C5400	B5339	50	0.015	845.5	845.3	Natural	0.50
35W103.1	B5339	46TH-8	129	0.014	837.0	836.4	Circular	3.00
35W103.2	B5339	46TH-8	129	0.015	845.3	844.6	Natural	0.50
35W104.1	46TH-8	B5401	31	0.014	835.6	835.5	Circular	3.50
35W104.2	46TH-8	B5401	31	0.015	844.6	844.4	Natural	0.50
35W105.1	B5401	B5352	25	0.014	835.5	835.4	Circular	3.50
35W105.2	B5401	B5352	25	0.015	844.4	844.2	Natural	0.50
35W106.1	B5352	C5402	70	0.014	835.3	834.9	Circular	3.50
35W106.2	B5352	C5402	70	0.015	844.2	843.7	Natural	0.50
35W107.1	C5402	B5353	30	0.014	834.9	834.8	Circular	3.50
35W107.2	C5402	B5353	30	0.015	843.7	843.5	Natural	0.50
35W108.1	B5353	B5358	90	0.014	834.7	834.2	Circular	3.50
35W108.2	B5353	B5358	90	0.015	843.5	842.9	Natural	0.50
35W109.1	B5358	C5403	55	0.014	834.1	833.9	Circular	3.50
35W109.2	B5358	C5403	55	0.015	842.9	842.6	Natural	0.50
35W110.1	C5403	B5359	25	0.014	833.8	833.7	Circular	3.50
35W110.2	C5403	B5359	25	0.015	842.6	842.6	Natural	0.50
35W111.1	B5359	B5360	58	0.014	833.6	833.3	Circular	3.50
35W111.2	B5359	B5360	58	0.015	842.6	842.6	Natural	0.50
35W112.1	B5360	46TH-7	69	0.014	833.2	832.9	Circular	3.50
35W112.2	B5360	46TH-7	69	0.015	842.6	842.1	Natural	0.50
35W113.1	46TH-7	46TH-6	166	0.014	832.8	832.0	Circular	3.50
35W113.2	46TH-7	46TH-6	166	0.015	842.1	840.4	Natural	0.50

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
35W114.1	46TH-6	B5407	223	0.014	824.7	823.9	Circular	4.00
35W114.2	46TH-6	B5407	223	0.015	840.4	837.2	Natural	0.50
35W115.1	B5407	46TH-5	224	0.014	823.8	822.9	Circular	4.00
35W115.2	B5407	46TH-5	224	0.015	837.2	833.1	Natural	0.50
35W116.1	46TH-5	46TH-4	210	0.014	822.8	821.9	Circular	4.00
35W116.2	46TH-5	46TH-4	210	0.015	833.1	830.4	Natural	0.50
35W117.1	46TH-4	46TH-3	190	0.014	821.5	820.7	Circular	4.00
35W117.2	46TH-4	46TH-3	190	0.015	830.4	829.1	Natural	0.50
35W118.1	46TH-3	B5417	139	0.014	820.6	820.0	Circular	4.00
35W118.2	46TH-3	B5417	139	0.015	829.1	828.8	Natural	0.50
35W119.1	B5417	B5439	30	0.014	819.5	819.4	Circular	4.50
35W119.2	B5417	B5439	30	0.015	828.8	828.8	Natural	0.50
35W120.1	B5439	46TH-2	59	0.014	819.3	819.1	Circular	4.50
35W120.2	B5439	46TH-2	59	0.015	828.8	828.9	Natural	0.50
35W121.1	46TH-2	B5474	110	0.014	818.6	818.2	Circular	5.00
35W121.2	46TH-2	B5474	110	0.015	828.9	829.3	Natural	0.50
35W122.1	B5474	B5565	105	0.014	818.2	817.8	Circular	5.00
35W122.2	B5474	B5565	10	0.014	0.1	0.0	Circular	0.05
35W200.1	46TH-14	46TH-13	388	0.014	848.1	846.2	Circular	2.00
35W200.2	46TH-14	46TH-13	388	0.015	854.5	851.5	Natural	0.50
35W201.1	46TH-13	46TH-12	292	0.014	845.5	844.0	Circular	2.25
35W201.2	46TH-13	46TH-12	215	0.015	851.5	849.8	Natural	0.50
35W202.1	46TH-12	46TH-11	215	0.014	843.2	842.3	Circular	3.00
35W202.2	46TH-12	46TH-11	215	0.015	849.8	848.7	Natural	0.50
35W203.1	46TH-11	46TH-10	230	0.014	842.2	841.3	Circular	3.00
35W203.2	46TH-11	46TH-10	230	0.015	848.7	847.6	Natural	0.50
35W204.1	46TH-1	B5472	287	0.014	824.2	822.8	Circular	2.00
35W204.2	46TH-1	B5472	287	0.015	831.1	829.1	Natural	0.50
35W205.1	B5472	46TH-2	60	0.015	821.4	821.1	Circular	2.50
35W205.2	B5472	46TH-2	60	0.015	829.1	828.9	Natural	0.50
35W206.1	B5496	B5501	247	0.014	825.5	824.3	Circular	1.75
35W206.2	B5496	B5501	247	0.015	832.5	830.2	Natural	0.50
35W207.1	B5501	C5427	230	0.014	823.6	821.7	Circular	2.00
35W207.2	B5501	C5427	230	0.015	830.2	827.4	Natural	0.50
35W208.1	C5427	C5428	10	0.014	821.6	821.6	Circular	2.00
35W208.2	C5427	C5428	10	0.015	827.4	827.3	Natural	0.50
35W209.1	C5428	C5429	100	0.014	821.3	820.5	Circular	2.25
35W209.2	C5428	C5429	100	0.015	827.3	825.8	Natural	0.50
36" 46_4A	46_4 A	46_4 B	17	0.013	827.6	827.4	Circular	3.00
36" 46_4B	46_4 B	46_MID	139	0.013	827.4	826.9	Circular	3.00
36" 46_M	46_MID	46_5A	173	0.013	826.9	826.3	Circular	3.00
36" 47_2	47_2	47_3	310	0.013	837.3	836.6	Circular	3.00
36" 47_3	47_3	47_CL	350	0.013	836.6	831.5	Circular	3.00
36" 47_4	47_4	47_4 A	24	0.013	828.8	828.0	Circular	3.00
36" 47_4A	47_4 A	47_4 B	32	0.013	828.0	828.2	Circular	3.00
36" 47_4B	47_4 B	47_5	329	0.013	828.2	825.5	Circular	3.00
36" 47_CL	47_CL	47_CL A	31	0.013	831.5	831.2	Circular	3.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
36" 47_CLA	47_CL A	47_4	278	0.013	831.2	828.8	Circular	3.00
36" 49_4A	49_4 A	49_5	332	0.013	823.7	822.7	Circular	3.00
42" 43_5	43_5	43_5A	11	0.013	829.1	829.0	Circular	3.50
42" 44_5	44_5	44_5A	40	0.013	828.1	828.0	Circular	3.50
42" 44_5A	44_5A	45_5	651	0.013	828.0	827.1	Circular	3.50
42" 5_43AD	43_5A	44_5	627	0.013	829.0	828.1	Circular	3.50
4-24-25-St	25-4th	24-4th	671	0.015	871.3	867.3	Natural	1.00
47TH_TRAP	U25857	B5561	300	0.015	859.2	839.8	Natural	0.50
48" 45_5	45_5	46_5	626	0.013	827.1	826.2	Circular	4.00
48" 46_5	46_5	46_5A	41	0.013	826.2	826.2	Circular	4.00
48" 46_5A	46_5A	5_46 MID	410	0.013	826.2	825.6	Circular	4.00
48" 5_46M	5_46 MID	47_5	200	0.013	825.6	825.3	Circular	4.00
54" 47_5	47_5	48_5	651	0.013	825.3	824.3	Circular	4.50
54" 48_5	48_5	49_5	657	0.013	824.3	822.7	Circular	4.50
57" 49_5	49_5	5_CRK	559	0.013	822.7	821.3	Circular	4.75
5th-24-25.	24-5th	25-5th	683	0.015	866.6	861.3	Natural	1.00
6" 50_BE	50_BE	U27577	861	0.016	916.8	909.5	Natural	0.50
9" 44_BL	44_BL ALL	44_BL ALL2	146	0.014	846.3	845.3	Circular	0.75
9" 44_WE	44_WE ALL	U23765	44	0.013	847.3	846.8	Circular	0.75
9" 45_PL2	45_PL ALL2	U24885	15	0.015	0.0	877.3	Natural	1.00
9" 48_BL	48_BL ALL	48_BL ALL2	124	0.013	855.8	855.3	Circular	0.75
9" 49_5M	49_5 MID	49_5	144	0.013	824.7	824.1	Circular	0.75
9"44_BL A	44_BL ALL2	44_BL ALL3	26	0.014	845.3	841.4	Circular	0.75
BLVD 4_PO	43_PO	OAK OUT7	265	0.100	837.0	834.0	Natural	0.50
BLVD 43_3	43_3	43_CL	355	0.100	838.0	839.0	Natural	0.50
BLVD 43_4	43_4	43_5	371	0.100	839.0	838.0	Natural	0.50
BLVD 43_5	43_5	43_5A	11	0.100	838.0	838.0	Natural	0.50
BLVD 43_CL	43_CL	43_4	329	0.100	839.0	839.0	Natural	0.50
BLVD 43_PO	43_PO	43_5	249	0.100	837.0	838.0	Natural	0.50
BLVD 44_2	44_2	44_3 MID	180	0.100	842.3	839.9	Natural	0.50
BLVD 44_3	44_3	44_3A	43	0.100	838.0	838.0	Natural	0.50
BLVD 44_3A	44_3A	44_CL	314	0.100	838.0	837.4	Natural	0.50
BLVD 44_4	44_4	44_4A	40	0.100	836.4	836.3	Natural	0.50
BLVD 44_4A	44_4A	44_5 B	310	0.100	836.3	835.0	Natural	0.50
BLVD 44_5	44_5	44_5A	40	0.100	835.0	835.0	Natural	0.75
BLVD 44_5A	44_5A	45_5	651	0.100	835.0	836.3	Natural	0.50
BLVD 44_CL	44_CL	44CL_MID	161	0.100	837.4	836.8	Natural	0.50
BLVD 44_PO	44_PO	44_5A	282	0.100	833.4	835.0	Natural	0.75
BLVD 45_4	45_4	45_5	314	0.100	837.3	836.3	Natural	0.50
BLVD 45_5	45_5	46_5	626	0.100	836.3	834.0	Natural	0.50
BLVD 45_CL	45_CL	45_CL A	32	0.100	836.3	836.3	Natural	0.50
BLVD 46_3	46_3	46_3A	78	0.100	836.3	836.3	Natural	0.50
BLVD 46_3A	46_3A	46_CL	281	0.100	836.3	834.0	Natural	0.50
BLVD 46_4	46_4	46_4 A	39	0.100	835.0	835.0	Natural	0.50
BLVD 46_M	46_MID	46_5A	173	0.100	834.5	834.0	Natural	0.50
BLVD 46_PO	46_PO	OAK OUT4	307	0.100	833.8	833.0	Natural	1.00
BLVD 48_1	48_1	48_ST	290	0.100	871.3	858.3	Natural	0.50

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
BLVD 48_5	48_5	49_5	657	0.100	832.3	830.0	Natural	0.50
BLVD 48_5M	48_5 MID	48_5	140	0.100	831.9	832.3	Natural	0.50
BLVD 48_BL	48_BL	48_BL MID	189	0.100	867.3	866.8	Natural	0.50
BLVD 48_PO	48_PO A	OAK OUT2	332	0.100	831.3	830.0	Natural	0.50
BLVD 48_WE	48_WE	48_BL	304	0.100	880.8	867.3	Natural	0.50
BLVD 48-NI	48_NI	48_NIA	86	0.100	866.3	866.3	Natural	0.50
BLVD 49_1.	49_1	49_ST	329	0.100	861.3	847.0	Natural	0.75
BLVD 49_4	49_4	49_4 A	31	0.100	829.0	829.0	Natural	0.75
BLVD 49_5	49_5	5_CRK	559	0.100	830.0	829.4	Natural	0.50
BLVD 49_5M	49_5 MID	49_5	145	0.100	829.0	830.0	Natural	0.75
BLVD 49_NI	49_NI	49_1	309	0.100	887.1	861.3	Natural	0.50
BLVD 49_ST	49_ST	49_ST A	27	0.100	847.0	847.0	Natural	0.75
BLVD 50_BE	50_BE	50_NI	306	0.100	917.3	904.3	Natural	0.50
BLVD 50_NI	50_NI	50_NI A	53	0.100	904.3	902.0	Natural	0.50
BLVD BE_50	BE_50	50_BE	44	0.100	917.3	917.3	Natural	0.50
BLVD BE_61	BE_61	BE_50	515	0.100	920.3	917.3	Natural	0.50
BLVD R53	R53	R58	345	0.100	857.3	840.0	Natural	0.50
BLVD43_2	43_2	43_3	289	0.100	839.0	838.0	Natural	0.50
BLVD43_3	43_3	44_3	666	0.100	838.0	838.0	Natural	0.50
BLVD44_3 M	44_3 MID	44_3	123	0.100	839.9	838.0	Natural	0.50
BLVD44_5 B	44_5 B	44_5A	16	0.100	835.0	835.0	Natural	0.75
BLVD44_CL	44_CL	45_CL	664	0.100	837.4	836.3	Natural	0.50
BLVD44_PO	44_POA	OAK OUT6	323	0.100	833.0	831.0	Natural	1.00
BLVD44_POA	44_POA	44_PO	68	0.100	833.0	833.4	Natural	1.00
BLVD44CL_M	44CL_MID	44_4	141	0.100	836.8	836.4	Natural	0.50
BLVD45_CL	45_CL	46_CL	655	0.100	836.3	834.0	Natural	0.50
BLVD45_CLA	45_CL A	45_4	350	0.100	836.3	837.3	Natural	0.50
BLVD46_4A	46_4 A	46_4 B	17	0.100	835.0	835.0	Natural	0.50
BLVD46_4B	46_4 B	46_MID	139	0.100	835.0	834.5	Natural	0.50
BLVD46_5	46_5	46_5A	41	0.100	833.5	833.5	Natural	0.50
BLVD46_CL	46_CL	46_CL A	32	0.100	834.0	834.0	Natural	0.50
BLVD46_CLA	46_CL A	46_4	294	0.100	834.0	835.0	Natural	0.50
BLVD46_PO	46_PO	46_PO A	62	0.100	833.8	834.0	Natural	0.50
BLVD46_POA	46_PO A	46_5A	295	0.100	834.0	834.0	Natural	0.50
BLVD48_BLM	48_BL MID	48_NI	172	0.100	866.8	866.3	Natural	0.50
BLVD48_NIA	48_NIA	48_1	287	0.100	866.3	871.3	Natural	0.50
BLVD48_PO	48_PO	48_5 MID	123	0.100	831.3	831.9	Natural	0.50
BLVD48_POA	48_PO A	48_PO	70	0.100	831.3	831.3	Natural	0.50
BLVD49_5MI	49_5 MID	OAK OUT1	187	0.100	829.0	828.0	Natural	0.75
BLVD49_STB	49_ST B	49_ST A	24	0.100	847.0	847.0	Natural	0.75
BLVD49_STE	49_ST E	49_ST A	35	0.100	847.0	847.0	Natural	0.75
BLVD5_43AD	43_5A	44_5	627	0.100	838.0	835.0	Natural	0.50
BLVD50_NIA	50_NI A	49_NI	488	0.100	902.0	887.1	Natural	0.50
BLVDST_49F	ST_49 F	49_ST E	206	0.100	862.0	847.0	Natural	0.75
BVLD 48_NI	48_NI	U25895	707	0.100	866.3	866.1	Natural	0.50
BVLD 49_2	49_2	49_2 MID	188	0.100	846.3	845.0	Natural	0.50
BVLD 49_3	49_3	49_3 A	69	0.100	844.3	844.3	Natural	0.50

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
BVLD 49_CL	49_CL	49_4	327	0.100	833.0	829.0	Natural	0.75
BVLD49_2M	49_2 MID	49_3	131	0.100	845.0	844.3	Natural	0.50
BVLD49_3A	49_3 A	49_CL	278	0.100	844.3	833.0	Natural	0.50
BVLD49_4A	49_4 A	49_5	332	0.100	829.0	830.0	Natural	0.75
i350-0	235-0	232-0	300	0.014	850.8	844.8	Natural	1.00
L100-1	28-Bla	28-Nic-2	398	0.014	865.5	864.2	Circular	1.75
L100-2	28-Bla	28-Nic-2	398	0.015	872.3	871.3	Natural	1.00
L101-1	29-Nic-2	29-Nic	52	0.014	866.5	866.3	Circular	1.75
L101-2	29-Nic-2	29-Nic	52	0.015	872.1	872.0	Natural	1.00
L102-1	N105	29-Nic-2	362	0.014	867.6	866.5	Circular	1.75
L102-2	N105	29-Nic-2	362	0.015	873.3	872.0	Natural	1.00
L103-1	29-Bla	N105	71	0.014	867.8	867.6	Circular	1.75
L103-2	29-Bla	N105	71	0.015	873.3	873.3	Natural	1.00
L104-1	29-Pils	29-Bla	396	0.014	869.0	867.8	Circular	1.50
L104-2	29-Pils	29-Bla	396	0.015	875.0	873.3	Natural	1.00
L105-1	29-pils-2	29-Pils	43	0.014	869.1	869.0	Circular	1.50
L105-2	29-pils-2	29-Pils	43	0.015	875.0	875.0	Natural	1.00
L106-1	29-Pleas	29-pils-2	369	0.014	870.9	869.2	Circular	1.00
L106-2	29-Pleas	29-pils-2	369	0.015	876.1	875.0	Natural	1.00
L107-1	29-5th-3	29-5th	38	0.014	843.7	843.4	Circular	1.00
L107-2	29-5th-3	29-5th	38	0.015	848.1	847.8	Natural	1.00
L108-1	29-5th-2	29-5th	40	0.014	841.0	840.4	Circular	2.50
L108-2	29-5th-2	29-5th	40	0.015	848.1	847.8	Natural	1.00
L109-1	29-HncAdd	29-5th-2	155	0.014	842.2	841.0	Circular	2.50
L109-2	29-HncAdd	29-5th-2	155	0.015	849.1	848.1	Natural	1.00
L1-1	24-Nic	24-1st	287	0.014	886.4	884.4	Circular	1.25
L1-1.1	R1	R7	80	0.014	855.6	853.5	Circular	0.75
L110-1	29-4th	29-HncAdd	179	0.014	844.7	842.2	Circular	2.50
L110-2	29-4th	29-HncAdd	179	0.015	850.3	849.1	Natural	1.00
L11-1	N22	24-3rd	316	0.014	880.4	879.9	Circular	2.00
L111-1	29-Clin	29-4th	281	0.014	852.9	845.4	Circular	2.00
L111-2	29-Clin	29-4th	281	0.015	868.3	850.3	Natural	1.00
L11-2	N22	24-3rd	316	0.015	887.8	887.4	Natural	1.00
L112-1	N115	29-Clin	19	0.014	853.0	852.9	Circular	2.50
L112-2	N115	29-Clin	19	0.015	866.8	868.3	Natural	1.00
L113-1	29-Dues	29-Clin	182	0.014	857.8	854.5	Circular	1.00
L113-2	29-Dues	29-Clin	182	0.015	866.0	868.3	Natural	1.00
L114-1	29-3rd	29-Dues	145	0.014	860.9	859.6	Circular	1.00
L114-2	29-3rd	29-Dues	145	0.015	867.3	866.0	Natural	1.00
L115-1	29-BouAdd	29-3rd	170	0.014	861.8	860.9	Circular	1.00
L115-2	29-BouAdd	29-3rd	170	0.015	865.7	867.3	Natural	1.00
L116-1	29-2nd	29-BouAdd	148	0.014	862.4	861.8	Circular	1.00
L116-2	29-2nd	29-BouAdd	148	0.015	867.8	865.7	Natural	1.00
L118-1	29-Port	29-5th-3	267	0.014	856.6	843.7	Circular	1.00
L118-2	29-Port	29-5th-3	267	0.015	866.1	848.1	Natural	1.00
L1-2	24-Nic	24-1st	287	0.015	893.3	890.5	Natural	1.00
L1-2.2	R1	R7	80	0.015	859.6	862.9	Natural	0.50

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
L12-1	N23	N24	59	0.014	876.3	875.3	Circular	2.00
L12-2	N23	N24	59	0.015	887.3	886.2	Natural	1.00
L124-1	Lake-Clin3	Lake-Clin	40	0.014	855.7	855.4	Circular	1.50
L124-2	Lake-Clin3	Lake-Clin	40	0.015	861.6	861.3	Natural	1.00
L125-1	Lake-Clin2	Lake-Clin	41	0.014	855.4	855.3	Circular	1.75
L125-2	Lake-Clin2	Lake-Clin	41	0.015	862.1	861.3	Natural	1.00
L126-1	N131	N115	215	0.014	854.0	853.0	Circular	2.50
L126-2	N131	N115	215	0.015	860.9	866.8	Natural	1.00
L127-1	Lake-Clin	N131	411	0.014	855.3	854.0	Circular	2.50
L127-2	Lake-Clin	N131	411	0.015	861.3	860.9	Natural	1.00
L128-1	Lake-4th	N132	35	0.014	859.5	858.7	Circular	1.50
L128-2	Lake-4th	N132	35	0.015	865.0	864.8	Natural	1.00
L129-1	N132	Lake-Clin3	243	0.014	858.7	855.7	Circular	1.50
L129-2	N132	Lake-Clin3	243	0.015	864.8	861.6	Natural	1.00
L130-1	Lake-3rd	Lake-Clin2	226	0.014	856.6	856.0	Circular	1.75
L130-2	Lake-3rd	Lake-Clin2	226	0.015	864.8	862.1	Natural	1.00
L13-1	N24	24-Clin	209	0.014	875.3	862.7	Circular	2.00
L131-1	Lake-3rd-2	Lake-3rd	104	0.014	859.3	858.9	Circular	1.50
L131-2	Lake-3rd-2	Lake-3rd	104	0.015	865.2	864.8	Natural	1.00
L13-2	N24	24-Clin	209	0.015	886.2	869.3	Natural	1.00
L132-1	Lake-2nd	Lake-3rd-2	257	0.014	860.4	859.5	Circular	1.50
L132-2	Lake-2nd	Lake-3rd-2	257	0.015	865.5	865.2	Natural	1.00
L133-1	Lake-4th-2	Lake-4th	74	0.014	859.9	859.5	Circular	1.00
L133-2	Lake-4th-2	Lake-4th	74	0.015	864.5	865.0	Natural	1.00
L135-1	N170	27-35W	187	0.014	843.0	841.1	Circular	2.25
L135-2	N170	27-35W	187	0.015	849.9	850.5	Natural	1.00
L136-1	29-35W	28-35W	400	0.014	866.1	853.7	Circular	1.00
L136-2	29-35W	28-35W	400	0.015	872.0	859.9	Natural	1.00
L137-1	26-1st	26-Stev	337	0.014	863.6	862.4	Circular	2.75
L137-2	26-1st	26-Stev	337	0.015	871.3	870.3	Natural	1.00
L14-1	24-4th	N25	35	0.014	857.3	857.1	Circular	2.25
L14-2	24-4th	N25	35	0.015	867.3	867.3	Natural	1.00
L150-1	MH76	24/25-35WB	163	0.014	846.4	844.5	Circular	2.50
L150-2	MH76	24/25-35WB	163	0.015	853.9	853.9	Natural	1.00
L15-1	N25	24-35W_1	95	0.014	856.0	849.1	Circular	2.00
L15-2	N25	24-35W_1	95	0.015	867.3	863.1	Natural	1.00
L155-1	24/25-35WA	24-35W_1	517	0.014	846.8	844.3	Circular	3.00
L155-2	24/25-35WA	24-35W_1	517	0.015	855.9	863.1	Natural	1.00
L157-1	25-35W	26-35W	813	0.014	839.5	835.2	Circular	5.00
L157-2	25-35W	26-35W	813	0.015	856.7	854.0	Natural	1.00
L158-1	28-35W	N169	362	0.014	853.2	845.2	Circular	1.50
L158-2	28-35W	N169	362	0.015	859.9	851.8	Natural	1.00
L159-1	N169	N170	275	0.014	844.4	843.0	Circular	2.25
L159-2	N169	N170	275	0.015	851.8	849.9	Natural	1.00
L1680	N2075	N2076	32	0.014	872.2	872.1	Circular	2.50
L1681	N2076	T20551	265	0.014	872.1	871.4	Circular	2.00
L17-1	22-35W	24/25-35WA	179	0.014	849.2	847.7	Circular	2.25

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
L17-2	22-35W	24/25-35WA	179	0.015	865.9	855.9	Natural	1.00
L18-1	24-35W_1	CB78	122	0.014	844.2	843.5	Circular	4.00
L18-2	24-35W_1	CB78	122	0.015	863.1	865.8	Natural	1.00
L19-1	24-Port-2	24-5th	256	0.014	858.4	857.2	Circular	1.50
L19-2	24-Port-2	24-5th	256	0.015	865.4	866.6	Natural	1.00
L20-1	24-5th	MH82	42	0.014	857.0	854.9	Circular	1.50
L20-2	24-5th	MH82	42	0.015	866.6	866.5	Natural	1.00
L21-1	MH82	MH80	112	0.014	853.6	848.3	Circular	1.50
L21-2	MH82	MH80	112	0.015	866.5	854.9	Natural	1.00
L22-1	MH80	MH76	144	0.014	847.8	846.4	Circular	2.00
L22-2	MH80	MH76	144	0.015	854.9	853.9	Natural	1.00
L23-1	CB78	24/25-35WB	260	0.014	843.5	842.2	Circular	4.00
L23-2	CB78	24/25-35WB	260	0.015	865.8	854.9	Natural	1.00
L232-1	232-0	DS2(35th)	320	0.014	837.8	831.7	Circular	2.75
L232-2	232-0	DS2(35th)	320	0.014	844.8	839.6	Natural	1.00
L24-1	25-Nic	25-1st	277	0.014	875.8	874.0	Circular	1.25
L24-2	25-Nic	25-1st	277	0.015	882.5	882.4	Natural	1.00
L25-1	25-1st	25-1st_2	34	0.014	874.0	873.4	Circular	1.50
L25-2	25-1st	25-1st_2	34	0.015	882.5	882.4	Natural	1.00
L25863-3O	U25863	48_ST	632	0.016	859.3	857.3	Natural	1.00
L26-1	25-1st_2	25-Stev	321	0.014	873.4	872.2	Circular	2.25
L26-2	25-1st_2	25-Stev	321	0.015	882.4	882.3	Natural	1.00
L27-1	25-Stev	25-ArtIn	319	0.014	872.1	871.3	Circular	2.50
L27-2	25-Stev	25-ArtIn	319	0.015	882.3	879.3	Natural	1.00
L28-1	25-ArtIn	25-3rd	314	0.014	871.3	869.5	Circular	2.75
L28-2	25-ArtIn	25-3rd	314	0.015	879.3	875.8	Natural	1.00
L29-1	25-3rd	25-3rd-2	34	0.014	869.5	868.7	Circular	3.00
L29-2	25-3rd	25-3rd-2	34	0.015	875.9	875.8	Natural	1.00
L30-1	25-3rd-2	25-Clin	296	0.014	868.7	867.2	Circular	3.00
L30-2	25-3rd-2	25-Clin	296	0.015	875.8	873.8	Natural	1.00
L3-1	24-1st	24-Stev	338	0.014	884.4	882.0	Circular	1.50
L31-1	25-Clin	25-4th	318	0.014	867.2	865.2	Circular	3.00
L31-2	25-Clin	25-4th	318	0.015	873.8	871.3	Natural	1.00
L3-2	24-1st	24-Stev	338	0.015	890.5	888.5	Natural	1.00
L32-1	25-4th	25-4th-2	30	0.014	865.2	865.0	Circular	3.00
L32-2	25-4th	25-4th-2	30	0.015	871.3	871.3	Natural	1.00
L35-1	25-4th-2	25-35W	180	0.014	845.4	840.5	Circular	2.50
L35-2	25-4th-2	25-35W	180	0.015	871.3	856.7	Natural	1.00
L359-3	26-Bla	27-Bla	668	0.015	871.8	870.2	Natural	0.50
L36-1	25-5th	25-35W	100	0.014	842.7	840.5	Circular	2.00
L36-2	25-5th	25-35W	100	0.015	861.3	856.7	Natural	1.00
L37-1	25-Port-2	25-5th	325	0.014	856.6	854.7	Circular	2.50
L37-2	25-Port-2	25-5th	325	0.015	862.3	861.3	Natural	1.00
L38-1	25-Port	25-Port-2	52	0.014	857.6	856.6	Circular	2.50
L38-2	25-Port	25-Port-2	52	0.015	862.3	862.3	Natural	1.00
L39-1	25-Oak	25-Port	308	0.014	858.5	857.6	Circular	1.75
L39-2	25-Oak	25-Port	308	0.015	864.3	862.3	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
L398	U23442-2	U24176	98	0.013	848.3	847.8	Circular	0.75
L40-1	24/25-35WB	25-35W	390	0.014	842.2	840.5	Circular	4.00
L40-2	24/25-35WB	25-35W	390	0.015	854.9	856.7	Natural	1.00
L408.1	49_ST A	49_2	304	0.013	839.0	837.0	Circular	2.50
L40TH-1	40TH	DS1(39th)	610	0.014	804.6	802.7	Circular	6.50
L40TH-2	40TH	DS1(39th)	610	0.015	832.2	837.6	Natural	1.00
L4-1	24-Stev	N22	322	0.014	882.0	880.4	Circular	2.00
L41-1	26-35W	27-35W	634	0.014	835.2	830.4	Circular	5.00
L41-2	26-35W	27-35W	634	0.015	854.0	850.3	Natural	1.00
L4-2	24-Stev	N22	322	0.015	888.5	887.8	Natural	1.00
L42ND-1.1	42ND	40TH	1210	0.014	808.7	805.1	Circular	6.50
L42ND-2.1	42ND	40TH	1210	0.015	821.2	832.2	Natural	0.50
L43-1	26-Bla	26-Nic	426	0.014	866.3	865.4	Circular	2.50
L43-2	26-Bla	26-Nic	426	0.015	871.3	872.3	Natural	1.00
L43RD-1-1	B5573	43RD-2	50	0.014	808.1	807.9	Circular	10.00
L43RD-1-2	B5573	43RD-2	50	0.015	826.2	824.7	Natural	0.50
L43RD-2-1	43RD-2	43RD-3	165	0.014	811.9	811.7	Circular	6.00
L43RD-2-2	43RD-2	43RD-3	165	0.015	824.7	824.7	Natural	0.50
L43RD-3-1	43RD-3	42ND	515	0.014	811.7	810.2	Circular	6.00
L43RD-3-2	43RD-3	42ND	515	0.015	824.7	821.2	Natural	0.50
L44-1	26-Nic	26-Nic-2	36	0.014	865.4	864.3	Circular	2.50
L44-2	26-Nic	26-Nic-2	36	0.015	872.3	872.3	Natural	1.00
L443	5_46 ALL	5_46 MID	151	0.013	830.8	830.5	Circular	0.75
L44TH-1	B5571	B5573	639	0.014	809.9	808.1	Circular	10.00
L44TH-2	B5571	B5573	639	0.015	833.2	826.2	Natural	0.50
L450	5_43 ALL	5_43 ALL2	98	0.013	833.6	833.1	Circular	0.75
L451	5_43 ALL2	43_5A	143	0.013	833.1	832.1	Circular	0.75
L45-1	26-Nic-2	26-1st	308	0.014	864.3	863.6	Circular	2.50
L45-2	26-Nic-2	26-1st	308	0.015	872.3	871.3	Natural	1.00
L45TH-1	B5569	B5571	710	0.014	812.0	809.9	Circular	10.00
L45TH-2	B5569	B5571	710	0.015	831.1	833.2	Natural	0.50
L46-1	26-Stev	27-Stev	661	0.014	862.4	859.7	Circular	3.00
L46-2	26-Stev	27-Stev	661	0.015	870.3	866.4	Natural	1.00
L474	44_3 ALL1	44_3 MID	130	0.013	835.3	834.6	Circular	0.75
L477	44_CL ALL	44CL_MID	290	0.013	832.3	831.3	Circular	1.00
L48	N50	26-Stev	339	0.014	875.1	864.5	Circular	1.00
L49-1	27-Pils	27-Bla	385	0.014	864.5	863.8	Circular	2.00
L49-2	27-Pils	27-Bla	385	0.015	872.3	870.2	Natural	1.00
L497	45_3 ALL	45_3 MID	275	0.013	832.8	831.8	Circular	0.75
L49TH_DI	49TH_DI	49TH_ORIF	59	0.014	831.0	830.6	Circular	4.00
L50-1	27-Bla	27-Bla-2	62	0.014	863.5	863.3	Circular	3.00
L50-2	27-Bla	27-Bla-2	62	0.015	870.2	870.1	Natural	1.00
L506	46_2 ALL1	46_2 MID	368	0.013	833.8	832.8	Circular	0.75
L507	46_MID B	46_MID A	35	0.013	832.1	831.9	Circular	0.75
L508	46_2 ALL	46_MID B	294	0.013	833.6	832.1	Circular	0.75
L5-1	24-3rd	N23	101	0.014	879.9	876.3	Circular	2.00
L51-1	27-Bla-2	27-Nic	373	0.014	863.3	861.9	Circular	3.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
L51-2	27-Bla-2	27-Nic	373	0.015	870.1	868.9	Natural	1.00
L5-2	24-3rd	N23	101	0.015	887.4	887.3	Natural	1.00
L520	46_4 ALL	46_MID	177	0.013	829.1	828.3	Circular	1.00
L52-1	27-Nic	27-Nic-2	88	0.014	861.2	860.6	Circular	3.50
L52-2	27-Nic	27-Nic-2	88	0.015	869.0	868.9	Natural	1.00
L53-1	27-Nic-2	27-1st	280	0.014	860.5	859.2	Circular	3.50
L53-2	27-Nic-2	27-1st	280	0.015	868.9	867.3	Natural	1.00
L538	48_5 ALL	48_5 MID	77	0.013	826.6	825.8	Circular	0.75
L54-1	27-1st	27-Stev	292	0.014	859.2	857.2	Circular	3.50
L54-2	27-1st	27-Stev	292	0.015	867.4	866.4	Natural	1.00
L545	49_2 ALL	49_2 MID	166	0.013	841.1	839.3	Circular	0.75
L546	R255	43_5	674	0.016	840.2	837.8	Natural	0.50
L55-1	27-Stev	27-Stev-2	57	0.014	853.7	853.9	Circular	3.50
L55-2	27-Stev	27-Stev-2	57	0.015	866.4	866.3	Natural	1.00
L557	49_RU ALL	U27025	219	0.016	900.1	898.8	Natural	0.50
L56-1	27-Stev-2	27-2nd	292	0.014	853.9	851.2	Circular	4.50
L56-2	27-Stev-2	27-2nd	292	0.015	866.2	865.3	Natural	1.00
L563	U24206-2	U24220	458	0.013	860.3	857.8	Circular	0.75
L564	U24206-2	44_WE ALL3	150	0.016	864.5	859.0	Natural	0.50
L565	44_WE ALL3	U24211	400	0.016	859.0	858.3	Natural	0.50
L566	T23794	N509	474	0.013	875.4	873.5	Circular	1.00
L569	N509	T23544	25	0.013	875.0	874.9	Circular	0.83
L57-1	27-2nd	27-2nd-2	40	0.014	851.2	851.5	Circular	4.50
L57-2	27-2nd	27-2nd-2	40	0.015	865.4	865.3	Natural	1.00
L576	T22233	42_HA	155	0.016	882.5	881.7	Natural	0.50
L577	42_HA	T22824	174	0.016	881.1	880.1	Natural	1.00
L578	T22962	U23539	380	0.016	875.0	870.8	Natural	0.50
L579	R14	R48	300	0.016	845.8	839.5	Circular	1.00
L58-1	27-2nd-2	27-3rd	290	0.014	851.5	848.6	Circular	4.50
L58-2	27-2nd-2	27-3rd	290	0.015	865.3	864.3	Natural	1.00
L587	U26732	RU	404	0.016	895.8	890.5	Natural	0.50
L589	49_5 ALL	49_5 MID	268	0.013	825.8	824.7	Circular	0.75
L59-1	27-3rd	27-Clint	113	0.014	848.6	847.8	Circular	4.50
L59-2	27-3rd	27-Clint	113	0.015	864.3	864.2	Natural	1.00
L594	46_3B	46_3	365	0.016	836.5	836.3	Natural	0.50
L595	46_2 ALL1	46_3B	155	0.100	836.5	836.5	Natural	0.50
L596	46_2 ALL	46_3C	166	0.100	836.5	836.5	Natural	0.50
L597	46_3C	46_3	308	0.016	836.5	836.3	Natural	0.50
L598	45_PO	OAK OUT5	389	0.016	835.3	831.5	Natural	0.50
L600	47_PO	OAK OUT3	384	0.016	834.4	833.5	Natural	0.50
L60-1	27-Clint	27-Clint-2	37	0.014	847.5	847.2	Circular	4.50
L60-2	27-Clint	27-Clint-2	37	0.015	864.2	864.3	Natural	1.00
L606	44_3 ALL1	44_3	250	0.100	839.8	838.0	Natural	0.50
L607	45_3 ALL	45_CL	400	0.100	835.8	836.3	Natural	0.50
L6-1	24-Clin	24-4th	304	0.014	861.4	859.1	Circular	2.25
L610	49_RU ALL2	RU	316	0.100	895.5	890.5	Natural	0.50
L611	49_RU ALL	49_PL MID	146	0.016	900.1	898.4	Natural	0.50

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
L61-1	27-Clint-2	27-35W	220	0.014	833.8	831.2	Circular	4.00
L61-2	27-Clint-2	27-35W	220	0.015	864.3	850.5	Natural	1.00
L6-2	24-Clin	24-4th	304	0.015	869.3	867.3	Natural	1.00
L62-1	27-35W	DS4(27TH)	187	0.014	829.5	827.4	Circular	6.50
L62-2	27-35W	DS4(27TH)	187	0.014	850.9	859.0	Natural	1.00
L63	27-4th	DS4(27TH)	150	0.014	847.2	846.3	Circular	3.00
L65	N67	DS4(27TH)	609	0.014	837.7	836.6	Circular	4.00
L66-1	N69	27-4th	176	0.014	847.6	847.4	Circular	3.00
L66-2	N69	27-4th	176	0.015	857.8	859.3	Natural	1.00
L67-1	27-5th	N69	145	0.014	847.8	847.6	Circular	3.00
L67-2	27-5th	N69	145	0.015	857.3	857.8	Natural	1.00
L68-1	27-5th-2	27-5th	73	0.014	848.1	847.8	Circular	3.00
L68-2	27-5th-2	27-5th	73	0.015	857.8	857.3	Natural	1.00
L69-1	27-Port	27-5th-2	249	0.014	853.6	851.9	Circular	2.00
L69-2	27-Port	27-5th-2	249	0.015	861.3	857.8	Natural	1.00
L7009A	7009A	J7010	118	0.014	815.8	812.9	Circular	4.00
L70-1	27-Port-2	27-Port	71	0.014	854.2	853.6	Circular	2.00
L70-2	27-Port-2	27-Port	71	0.015	861.3	861.3	Natural	1.00
L71-1	27-Oak	27-Port-2	276	0.014	855.8	854.2	Circular	2.00
L71-2	27-Oak	27-Port-2	276	0.015	864.3	861.3	Natural	1.00
L72-1	27-Park	27-Oak	284	0.014	858.0	855.8	Circular	2.00
L72-2	27-Park	27-Oak	284	0.015	863.3	864.3	Natural	1.00
L73-1	27-Park-2	27-Park	87	0.014	858.6	858.1	Circular	1.75
L73-2	27-Park-2	27-Park	87	0.015	863.4	863.3	Natural	1.00
L74-1	27-Colum	27-Park-2	276	0.014	860.0	858.6	Circular	1.00
L74-2	27-Colum	27-Park-2	276	0.015	864.3	863.3	Natural	1.00
L75-1	28-Clin	N67	160	0.014	848.3	844.1	Circular	2.00
L75-2	28-Clin	N67	160	0.015	861.4	853.0	Natural	1.00
L76-1	2Av-Clin	28-Clin	117	0.014	850.1	849.6	Circular	2.00
L76-2	2Av-Clin	28-Clin	117	0.015	858.8	861.4	Natural	1.00
L78	2Av-Clin-3	2Av-Clin	38	0.014	853.2	852.7	Circular	1.50
L79	2-3AV	2Av-Clin-3	242	0.014	856.1	853.5	Circular	1.50
L80	2-3Av-2	2-3AV	84	0.014	857.2	856.3	Circular	1.50
L81-1	28-4th	N67	136	0.014	838.1	837.7	Circular	4.00
L81-2	28-4th	N67	136	0.015	849.1	853.0	Natural	1.00
L82-1	28-5th	28-4th	241	0.014	838.8	838.1	Circular	4.00
L82-2	28-5th	28-4th	241	0.015	849.3	849.1	Natural	1.00
L83-1	28-5th-2	28-5th	36	0.014	843.3	842.7	Circular	2.25
L83-2	28-5th-2	28-5th	36	0.015	848.3	849.3	Natural	1.00
L84-1	29-5th	28-5th	670	0.014	840.1	838.8	Circular	2.50
L84-2	29-5th	28-5th	670	0.015	847.8	849.3	Natural	1.00
L85-1	TorAdd	28-5th-2	125	0.014	844.7	843.3	Circular	2.00
L85-2	TorAdd	28-5th-2	125	0.015	853.3	848.3	Natural	1.00
L86-1	28-Port	TorAdd	136	0.014	847.3	844.7	Circular	2.00
L86-2	28-Port	TorAdd	136	0.015	859.0	853.3	Natural	1.00
L87-1	28-Port-2	28-Port	76	0.014	847.7	847.7	Circular	2.00
L87-2	28-Port-2	28-Port	76	0.015	859.6	859.0	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
L88-1	28-Oak	28-Port-2	324	0.014	854.2	851.1	Circular	2.00
L88-2	28-Oak	28-Port-2	324	0.015	863.5	859.6	Natural	1.00
L89-1	28-Park	28-Oak	294	0.014	856.7	854.8	Circular	1.75
L89-2	28-Park	28-Oak	294	0.015	865.2	863.5	Natural	1.00
L90-1	28-Park-2	28-Park	44	0.014	857.0	856.7	Circular	1.75
L90-2	28-Park-2	28-Park	44	0.015	865.3	865.2	Natural	1.00
L9-1	24-Port	24-Port-2	63	0.014	860.5	859.9	Circular	1.25
L91-1	28-Colum	28-Park-2	307	0.014	858.5	857.0	Circular	1.50
L91-2	28-Colum	28-Park-2	307	0.015	866.0	865.3	Natural	1.00
L9-2	24-Port	24-Port-2	63	0.015	865.6	865.4	Natural	1.00
L92-1	28-Stev	27-Stev	650	0.014	861.1	858.8	Circular	2.75
L92-2	28-Stev	27-Stev	635	0.015	868.3	866.4	Natural	1.00
L93-1	28-Stev-2	28-Stev	43	0.014	861.3	861.2	Circular	2.75
L93-2	28-Stev-2	28-Stev	43	0.015	868.4	868.3	Natural	1.00
L94-1	28-1st	28-Stev-2	291	0.014	862.4	861.6	Circular	2.50
L94-2	28-1st	28-Stev-2	291	0.015	869.8	868.3	Natural	1.00
L95-1	28-1st-2	28-1st	36	0.014	863.1	862.9	Circular	2.50
L95-2	28-1st-2	28-1st	36	0.015	869.9	869.8	Natural	1.00
L96-1	28-Nic	28-1st-2	291	0.014	864.1	863.1	Circular	2.00
L96-2	28-Nic	28-1st-2	291	0.015	871.3	869.8	Natural	1.00
L97-1	28-Nic-2	28-Nic	52	0.014	864.2	864.1	Circular	2.00
L97-2	28-Nic-2	28-Nic	52	0.015	871.4	871.3	Natural	1.00
L99-1	29-Nic	28-Nic	397	0.014	866.3	864.6	Circular	1.75
L99-2	29-Nic	28-Nic	397	0.015	872.0	871.3	Natural	1.00
LB5565-1	B5565	B5569	288	0.014	812.8	812.0	Circular	10.00
LB5565-2	B5565	B5569	288	0.015	829.3	831.1	Natural	0.50
LC5429	C5429	C5430	97	0.014	820.4	819.5	Circular	2.25
LC5430	C5430	B5573	92	0.014	815.4	815.0	Circular	2.50
LD6172-1	D6172	D6572	342	0.014	845.1	842.9	Circular	1.50
LD6172-2	D6172	D6572	342	0.015	848.0	849.3	Natural	1.00
LD6504-1	D6504	D6572	148	0.014	843.6	842.9	Circular	1.00
LD6504-2	D6504	D6572	148	0.015	848.8	849.3	Natural	1.00
LD6572-1	D6572	D6708	366	0.014	842.9	841.1	Circular	2.50
LD6572-2	D6572	D6708	366	0.015	849.3	848.1	Natural	1.00
LD6591-1	D6591	D6720	193	0.014	839.9	839.4	Circular	1.50
LD6591-2	D6591	D6720	193	0.015	845.6	846.7	Natural	1.00
LD6616-1	D6616	D6591	66	0.014	840.5	839.8	Circular	1.00
LD6616-2	D6616	D6591	66	0.015	844.5	845.6	Natural	1.00
LD6667-1	D6667	D6572	152	0.014	844.7	842.9	Circular	1.75
LD6667-2	D6667	D6572	152	0.015	851.3	849.3	Natural	1.00
LD6706-1	D6706	D6761	55	0.014	831.0	830.8	Circular	4.00
LD6706-2	D6706	D6761	55	0.015	839.6	840.0	Natural	1.50
LD6708-1	D6708	D6774	219	0.014	841.1	840.6	Circular	2.50
LD6708-2	D6708	D6774	219	0.015	848.1	847.3	Natural	1.00
LD6720-1	D6720	D6776	49	0.014	839.4	839.3	Circular	1.75
LD6720-2	D6720	D6776	49	0.015	846.7	846.8	Natural	1.00
LD6751-1	D6780	D6667	118	0.014	846.1	844.7	Circular	1.75

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LD6751-2	D6780	D6667	118	0.015	853.2	851.3	Natural	1.00
LD6761-1	D6761	D6846	51	0.014	830.8	830.6	Circular	4.00
LD6761-2	D6761	D6846	51	0.015	840.0	839.8	Natural	1.00
LD6774-1	D6774	D6776	82	0.014	840.2	839.3	Circular	2.75
LD6774-2	D6774	D6776	82	0.015	847.3	846.8	Natural	1.00
LD6776-1	D6776	D6818	35	0.014	839.1	839.0	Circular	3.50
LD6776-2	D6776	D6818	35	0.015	846.8	846.6	Natural	1.00
LD6813-1	D6813	D6846	68	0.014	832.7	832.6	Circular	4.00
LD6813-2	D6813	D6846	68	0.015	839.8	839.8	Natural	1.00
LD6818-1	D6818	D6813	552	0.014	839.0	832.7	Circular	3.50
LD6818-2	D6818	D6813	552	0.015	846.6	839.8	Natural	1.00
LD6844-1	D6844	D6818	25	0.014	839.1	839.0	Circular	3.50
LD6844-2	D6844	D6818	25	0.015	846.8	846.6	Natural	1.00
LD6847-1	D6847	D6953	50	0.014	826.6	826.4	Circular	6.00
LD6847-2	D6847	D6953	50	0.015	840.3	840.3	Natural	1.00
LD6852-1	D6852	D6853	53	0.014	827.7	826.7	Circular	6.00
LD6852-2	D6852	D6853	53	0.015	839.3	839.3	Natural	1.00
LD6853-1	D6853	D6847	275	0.014	826.7	826.6	Circular	6.00
LD6853-2	D6853	D6847	275	0.015	839.3	840.3	Natural	1.00
LD6857-1	D6846	D6865	396	0.014	830.6	829.2	Circular	5.50
LD6857-2	D6846	D6865	396	0.015	839.8	841.3	Natural	1.00
LD6865-1	D6865	D6894	224	0.014	829.2	828.2	Circular	6.00
LD6865-2	D6865	D6894	224	0.015	841.3	839.8	Natural	1.00
LD6894-1	D6894	D6852	143	0.014	828.2	827.7	Circular	6.00
LD6894-2	D6894	D6852	143	0.015	839.8	839.3	Natural	1.00
LD6948-1	D6948	D6852	42	0.014	830.4	830.3	Circular	2.00
LD6948-2	D6948	D6852	42	0.015	839.8	839.3	Natural	1.00
LD6953-1	D6953	D7121	251	0.014	826.4	825.0	Circular	6.00
LD6953-2	D6953	D7121	251	0.015	840.3	841.3	Natural	1.00
LD7121-1	D7121	D7176	174	0.014	823.4	823.1	Circular	6.00
LD7121-2	D7121	D7176	174	0.015	841.3	841.8	Natural	1.00
LD7150-1	D7150	D6865	295	0.014	833.5	831.0	Circular	3.50
LD7150-2	D7150	D6865	295	0.015	842.5	841.3	Natural	1.00
LD7163-1	D7163	D6948	283	0.014	835.8	833.4	Circular	1.50
LD7163-2	D7163	D6948	283	0.015	843.3	839.8	Natural	1.00
LD7165-1	D7165	D7185	68	0.014	836.4	836.1	Circular	1.25
LD7165-2	D7165	D7185	68	0.015	844.3	844.2	Natural	1.00
LD7170-1	D7170	D7121	33	0.014	823.6	823.4	Circular	6.00
LD7170-2	D7170	D7121	33	0.015	841.6	841.3	Natural	1.00
LD7176-1	D7176	D7436	400	0.014	823.1	822.4	Circular	6.00
LD7176-2	D7176	D7436	400	0.015	841.8	840.8	Natural	1.00
LD7181-1	D7181	D7150	30	0.014	835.1	835.0	Circular	2.75
LD7181-2	D7181	D7150	30	0.015	842.6	842.5	Natural	1.00
LD7185-1	D7185	D7181	313	0.014	835.9	835.1	Circular	2.75
LD7185-2	D7185	D7181	313	0.015	844.2	842.6	Natural	1.00
LD7185-3	D7185	D6846	324	0.015	844.2	839.8	Natural	1.00
LD7264-1	D7264	D7185	54	0.014	837.4	837.4	Circular	2.50

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LD7264-2	D7264	D7185	54	0.015	844.7	844.2	Natural	1.00
LD7436-1	D7436	D7476	79	0.014	822.4	822.3	Circular	6.00
LD7436-2	D7436	D7476	79	0.015	840.8	840.8	Natural	1.00
LD7476-1	D7476	D7521	46	0.014	822.3	822.2	Circular	6.00
LD7476-2	D7476	D7521	46	0.015	840.8	840.8	Natural	1.00
LD7521-1	D7521	D7588	50	0.014	822.2	822.1	Circular	6.00
LD7521-2	D7521	D7588	50	0.015	840.8	840.8	Natural	1.00
LD7539-1	D7539	D7150	309	0.014	836.6	835.0	Circular	1.50
LD7539-2	D7539	D7150	309	0.015	843.6	842.5	Natural	1.00
LD7552-1	D7552	D7264	256	0.014	840.2	837.8	Circular	2.00
LD7552-2	D7552	D7264	256	0.015	846.3	844.7	Natural	1.00
LD7588-1	D7588	DS6	264	0.014	822.1	821.6	Circular	6.00
LD7588-2	D7588	DS6	264	0.015	840.8	840.9	Natural	1.00
LD7746-1	D7746	D7539	274	0.014	837.9	836.6	Circular	1.50
LD7746-2	D7746	D7539	274	0.015	844.6	843.6	Natural	1.00
LD7886-1	D7886	D7552	319	0.014	842.0	840.2	Circular	1.50
LD7886-2	D7886	D7552	319	0.015	848.3	846.3	Natural	1.00
LDS1-1	DS1(39th)	DS2(35th)	2724	0.014	749.5	745.7	Circular	12.00
LDS12	DS12	DS13	300	0.014	742.3	742.0	Circular	9.00
LDS13	DS13	DS14	1375	0.014	742.0	740.6	Circular	9.00
LDS14	DS14	DS15	675	0.014	737.6	736.9	Circular	12.00
LDS15	DS15	DS16	300	0.014	736.9	736.7	Circular	12.00
LDS16-1	DS16	JUNCT	150	0.014	736.7	736.5	Circular	12.00
LDS16-2	DS16	JUNCT	150	0.015	810.9	855.5	Natural	1.00
LDS3(31ST)	DS3(31ST)	DS4(27TH)	2765	0.014	743.1	739.4	Circular	12.00
LDS4(27TH)	DS4(27TH)	JUNCT	4455	0.014	739.4	736.4	Circular	12.00
LDS6	DS6	DS7	1775	0.014	731.5	729.7	Circular	14.00
LDS7	DS7	DS8	600	0.014	729.7	729.3	Circular	14.00
LDS8	DS8	DS9	2000	0.014	729.3	727.5	Circular	14.00
LDS9	DS9	RIVER	825	0.014	727.5	726.8	Circular	14.00
LG7878-1	G7878	G7922	33	0.014	843.6	843.1	Special	2.61
LG7878-2	G7878	G7922	33	0.015	856.3	856.3	Natural	1.00
LG7893-1	G7893	G7878	296	0.014	845.9	845.0	Circular	3.50
LG7893-2	G7893	G7878	296	0.015	857.3	856.3	Natural	1.00
LG7903-1	G7903	G7893	300	0.014	847.1	845.9	Circular	3.50
LG7903-2	G7903	G7893	300	0.015	856.3	857.3	Natural	1.00
LG7922-1	G7922	G8248	372	0.014	843.1	841.3	Circular	4.00
LG7922-2	G7922	G8248	372	0.015	856.3	857.8	Natural	1.00
LG7944-1	G7944	G7922	304	0.014	848.6	848.3	Circular	1.25
LG7944-2	G7944	G7922	304	0.015	855.8	856.3	Natural	1.00
LG7955-1	G7955	G7903	79	0.014	847.2	847.1	Circular	3.50
LG7955-2	G7955	G7903	79	0.015	856.3	856.3	Natural	1.00
LG7985-1	G7985	G7955	287	0.014	848.3	847.2	Circular	3.00
LG7985-2	G7985	G7955	287	0.015	855.3	856.3	Natural	1.00
LG7985-4	G7985	DS13	381	0.015	855.3	853.2	Natural	1.00
LG8163-1	G8163	DS14	19	0.014	849.0	848.9	Circular	3.00
LG8163-2	G8163	DS14	19	0.015	855.3	856.5	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LG8219-1	G8374	G7985	272	0.014	854.4	850.1	Circular	2.75
LG8219-2	G8374	G7985	272	0.015	860.8	855.3	Natural	1.00
LG8248-1	G8248	G8252	259	0.014	841.3	839.8	Circular	4.50
LG8248-2	G8248	G8252	259	0.015	857.8	857.3	Natural	1.00
LG8250-1	G8250	DS14	121	0.014	836.6	836.0	Circular	4.50
LG8250-2	G8250	DS14	121	0.015	857.8	856.5	Natural	1.00
LG8251-1	G8251	G8255	110	0.014	837.4	837.5	Circular	4.50
LG8251-2	G8251	G8255	110	0.015	857.3	857.6	Natural	1.00
LG8252-1	G8252	G8251	18	0.014	839.8	837.4	Circular	4.50
LG8252-2	G8252	G8251	18	0.015	857.3	857.3	Natural	1.00
LG8253-1	G8253	G8250	4	0.014	837.1	836.6	Circular	4.50
LG8253-2	G8253	G8250	4	0.015	857.8	857.8	Natural	1.00
LG8254-1	G8254	G8163	59	0.014	849.6	849.0	Circular	2.25
LG8254-2	G8254	G8163	59	0.015	857.3	855.3	Natural	1.00
LG8255-1	G8255	G8253	81	0.014	837.3	836.3	Circular	4.50
LG8255-2	G8255	G8253	81	0.015	857.6	857.8	Natural	1.00
LG8261-1	G8261	G8254	283	0.014	850.5	849.6	Circular	1.25
LG8261-2	G8261	G8254	283	0.015	856.3	857.3	Natural	1.00
LG8261-4	G8261	DS15	349	0.015	856.3	845.0	Natural	0.50
LG8273-1	G8273	G8280	289	0.014	853.2	851.2	Circular	1.75
LG8273-2	G8273	G8280	289	0.015	860.8	858.3	Natural	1.00
LG8275-1	G8275	G8248	44	0.014	846.4	845.3	Circular	2.50
LG8275-2	G8275	G8248	44	0.015	857.8	857.8	Natural	1.00
LG8276-1	G8276	G8275	294	0.014	850.0	849.2	Circular	2.50
LG8276-2	G8276	G8275	294	0.015	858.3	857.8	Natural	1.00
LG8280-1	G8280	G8276	34	0.014	851.0	850.9	Circular	1.75
LG8280-2	G8280	G8276	34	0.015	858.4	858.3	Natural	1.00
LG8326-1	G8326	G8254	26	0.014	850.1	850.0	Circular	2.25
LG8326-2	G8326	G8254	26	0.015	857.3	857.3	Natural	1.00
LG8337-1	G8337	G8255	84	0.014	850.6	848.6	Circular	2.00
LG8337-2	G8337	G8255	84	0.015	857.3	857.6	Natural	1.00
LG8380-1	G8380	G8273	36	0.014	854.2	854.2	Circular	1.75
LG8380-2	G8380	G8273	36	0.015	861.3	860.8	Natural	1.00
LG8430-1	G8430	G8380	108	0.014	856.0	854.3	Circular	1.75
LG8430-2	G8430	G8380	108	0.015	863.3	861.3	Natural	1.00
LG8484-1	G8484	G8374	188	0.014	855.8	854.4	Circular	2.75
LG8484-2	G8484	G8374	188	0.015	863.3	860.8	Natural	1.00
LG8502-1	G8502	G8588	271	0.014	0.0	0.0	Circular	0.00
LG8502-2	G8502	G8588	271	0.015	0.0	0.0	Natural	1.00
LG8580-1	G8580	G8484	103	0.014	856.7	855.8	Circular	2.75
LG8580-2	G8580	G8484	103	0.015	864.3	863.3	Natural	1.00
LG8588-1	G8588	G8615	31	0.014	0.0	0.0	Circular	0.00
LG8588-2	G8588	G8615	31	0.015	0.0	0.0	Natural	1.00
LG8590-1	G8590	G8608	51	0.014	864.6	864.3	Circular	2.00
LG8590-2	G8590	G8608	51	0.015	873.3	872.3	Natural	1.00
LG8592-1	G8592	G8594	26	0.014	866.0	865.3	Circular	2.00
LG8592-2	G8592	G8594	26	0.015	873.4	873.3	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LG8594-1	G8594	G8590	21	0.014	865.3	864.6	Circular	2.00
LG8594-2	G8594	G8590	21	0.015	873.4	873.3	Natural	1.00
LG8599-1	G8618	G8600	301	0.014	890.7	871.8	Circular	1.50
LG8599-2	G8618	G8600	301	0.015	897.3	878.3	Natural	1.00
LG8600-1	G8600	G8592	40	0.014	866.8	866.0	Circular	2.00
LG8600-2	G8600	G8592	40	0.015	878.3	873.3	Natural	1.00
LG8608-1	G8608	G8610	243	0.014	864.3	860.1	Circular	2.00
LG8608-2	G8608	G8610	243	0.015	872.3	866.3	Natural	1.00
LG8610-1	G8610	G8612	48	0.014	860.1	859.6	Circular	2.00
LG8610-2	G8610	G8612	48	0.015	866.3	864.8	Natural	1.00
LG8611-1	G8611	G8580	43	0.014	856.5	856.7	Circular	2.75
LG8611-2	G8611	G8580	43	0.015	864.8	864.3	Natural	1.00
LG8612-1	G8612	G8611	62	0.014	859.6	859.5	Circular	2.00
LG8612-2	G8612	G8611	62	0.015	864.9	864.8	Natural	1.00
LG8615-1	G8615	G8618	21	0.014	0.0	0.0	Circular	0.00
LG8615-2	G8615	G8618	21	0.015	0.0	897.3	Natural	1.00
LG8620-1	G8620	G8594	30	0.014	866.9	865.3	Circular	1.50
LG8620-2	G8620	G8594	30	0.015	873.4	873.3	Natural	1.00
LG8632-1	G8632	G8612	28	0.014	860.3	859.7	Circular	1.00
LG8632-2	G8632	G8612	28	0.015	865.3	864.8	Natural	1.00
LG8678-1	G8678	G8326	427	0.014	852.8	850.1	Circular	2.25
LG8678-2	G8678	G8326	427	0.015	858.8	857.3	Natural	1.00
LG8685-1	G8685	G8611	81	0.014	859.7	859.3	Circular	1.75
LG8685-2	G8685	G8611	81	0.015	865.6	864.8	Natural	1.00
LG8699-1	G8699	G8276	446	0.014	853.1	850.2	Circular	2.00
LG8699-2	G8699	G8276	446	0.015	860.3	858.3	Natural	1.00
LG8710-1	G8710	G8678	326	0.014	853.7	852.8	Circular	1.75
LG8710-2	G8710	G8678	326	0.015	860.3	858.8	Natural	1.00
LG8721-1	G8721	G8430	319	0.014	860.3	856.0	Circular	1.75
LG8721-2	G8721	G8430	319	0.015	868.8	863.3	Natural	1.00
LG8721-3	G8721	G8745	328	0.015	868.8	860.3	Natural	1.00
LG8745-1	G8745	G8699	26	0.014	853.3	853.1	Circular	2.00
LG8745-2	G8745	G8699	26	0.015	860.4	860.3	Natural	1.00
LG8765-1	G8765	G8678	36	0.014	852.8	852.8	Circular	1.75
LG8765-2	G8765	G8678	36	0.015	858.8	858.8	Natural	1.00
LG8768-1	G8768	G8685	37	0.014	860.4	859.7	Circular	1.50
LG8768-2	G8768	G8685	37	0.015	866.1	865.6	Natural	1.00
LG8778-1	G8778	G8337	471	0.014	852.1	850.6	Circular	2.00
LG8778-2	G8778	G8337	471	0.015	859.3	857.3	Natural	1.00
LG8783-1	G8783	G8248	509	0.014	856.2	850.9	Circular	1.75
LG8783-2	G8783	G8248	509	0.015	862.3	857.8	Natural	1.00
LG8783-3	G8783	G8745	328	0.015	862.3	860.3	Natural	1.00
LG8805-1	G8805	G8618	132	0.014	897.1	892.7	Circular	1.25
LG8805-2	G8805	G8618	132	0.015	902.3	897.3	Natural	1.00
LG8817-1	G8817	G8620	166	0.014	870.0	866.9	Circular	1.50
LG8817-2	G8817	G8620	166	0.015	876.3	873.3	Natural	1.00
LG8820-1	G8820	G8610	194	0.014	0.0	0.0	Circular	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LG8820-2	G8820	G8610	194	0.015	0.0	866.3	Natural	1.00
LG8837-1	G8837	G8632	236	0.014	864.8	860.3	Circular	1.00
LG8837-2	G8837	G8632	236	0.015	870.3	865.3	Natural	1.00
LG8872-1	G8872	G8817	164	0.014	873.0	870.0	Circular	1.50
LG8872-2	G8872	G8817	164	0.015	880.8	876.3	Natural	1.00
LG9023-1	G9023	G8872	173	0.014	876.2	873.0	Circular	1.50
LG9023-2	G9023	G8872	173	0.015	884.7	880.8	Natural	1.00
LG9037-1	G9037	G8745	411	0.014	864.3	853.3	Circular	1.75
LG9037-2	G9037	G8745	411	0.015	872.3	860.3	Natural	1.00
LG9043-1	G9043	G8710	434	0.014	856.0	853.8	Circular	1.50
LG9043-2	G9043	G8710	434	0.015	864.5	860.3	Natural	1.00
LG9049-1	G9049	G8778	401	0.014	855.2	852.1	Circular	1.75
LG9049-2	G9049	G8778	401	0.015	862.1	859.3	Natural	1.00
LG9051-1	G9051	G8783	400	0.014	857.9	856.2	Circular	1.75
LG9051-2	G9051	G8783	400	0.015	863.8	862.3	Natural	1.00
LG9053-1	G9053	G8837	264	0.014	869.3	864.8	Circular	1.00
LG9053-2	G9053	G8837	264	0.015	875.3	870.3	Natural	1.00
LG9057-1	G9057	G9037	8	0.014	864.3	864.3	Circular	1.75
LG9057-2	G9057	G9037	8	0.015	872.3	872.3	Natural	1.00
LG9066-1	G9066	G8765	416	0.014	857.8	852.8	Circular	1.50
LG9066-2	G9066	G8765	416	0.015	864.3	858.8	Natural	1.00
LG9139-1	G9139	G9142	100	0.014	893.3	892.3	Circular	1.00
LG9139-2	G9139	G9142	100	0.015	898.2	897.4	Natural	1.00
LG9142-1	G9142	G9143	106	0.014	891.2	889.5	Circular	1.25
LG9142-2	G9142	G9143	106	0.015	897.4	895.5	Natural	1.00
LG9143-1	G9143	G9147	310	0.014	888.4	884.2	Circular	1.25
LG9143-2	G9143	G9147	310	0.015	895.5	889.9	Natural	1.00
LG9144-1	G9144	G9023	53	0.014	877.8	877.2	Circular	1.50
LG9144-2	G9144	G9023	53	0.015	885.7	884.7	Natural	1.00
LG9146-1	G9146	G9144	370	0.014	883.1	877.8	Circular	1.50
LG9146-2	G9146	G9144	370	0.015	889.1	885.7	Natural	1.00
LG9147-1	G9147	G9146	77	0.014	884.2	883.1	Circular	1.50
LG9147-2	G9147	G9146	77	0.015	889.9	889.1	Natural	1.00
LG9155-1	G9155	G8721	457	0.014	871.5	862.1	Circular	1.75
LG9155-2	G9155	G8721	457	0.015	881.3	868.8	Natural	1.00
LG9155-3	G9155	G9270	329	0.015	881.3	872.0	Natural	1.00
LG9165-1	G9165	G9155	242	0.014	872.7	871.5	Circular	1.25
LG9165-2	G9165	G9155	242	0.015	878.3	881.3	Natural	1.00
LG9165-3	G9165	G9053	112	0.015	878.3	875.3	Natural	1.00
LG9226-1	G9226	G9051	44	0.014	858.1	857.9	Circular	1.75
LG9226-2	G9226	G9051	44	0.015	864.1	863.8	Natural	1.00
LG9233-1	G9233	G9053	50	0.014	870.6	869.6	Circular	1.00
LG9233-2	G9233	G9053	50	0.015	876.8	875.3	Natural	1.00
LG9270-1	G9270	G9057	52	0.014	864.4	864.3	Circular	1.75
LG9270-2	G9270	G9057	52	0.015	872.0	872.3	Natural	1.00
LG9270-3	G9270	G9226	329	0.015	872.0	864.1	Natural	1.00
LG9274-1	G9274	G9049	56	0.014	855.6	855.2	Circular	1.75

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LG9274-2	G9274	G9049	56	0.015	862.6	862.1	Natural	1.00
LG9284-1	G9284	G9043	66	0.014	856.5	856.1	Circular	1.50
LG9284-2	G9284	G9043	66	0.015	864.5	864.5	Natural	1.00
LG9288-1	G9288	G9023	76	0.014	877.6	876.4	Circular	1.50
LG9288-2	G9288	G9023	76	0.015	884.6	884.7	Natural	1.00
LG9288-3	G9288	G9233	368	0.015	884.6	876.8	Natural	1.00
LG9289-1	G9289	G9066	60	0.014	859.3	857.8	Circular	1.50
LG9289-2	G9289	G9066	60	0.015	864.3	864.3	Natural	1.00
LI7111-1	I7111	I7290	99	0.014	841.8	841.2	Circular	2.00
LI7111-2	I7111	I7290	99	0.015	0.0	0.0	Natural	1.00
LI7166-1	I7166	I7538	293	0.014	844.8	844.3	Circular	2.75
LI7166-2	I7166	I7538	293	0.015	844.8	842.0	Natural	1.00
LI7177-1	I7177	I7403	148	0.014	849.0	848.3	Circular	2.00
LI7177-2	I7177	I7403	148	0.015	854.3	855.0	Natural	1.00
LI7258-1	I7258	I7290	38	0.014	842.0	841.2	Circular	2.00
LI7258-2	I7258	I7290	38	0.015	0.0	0.0	Natural	1.00
LI7290-1	I7290	I7312	33	0.014	841.2	840.4	Circular	2.00
LI7290-2	I7290	I7312	33	0.015	0.0	852.8	Natural	1.00
LI7312-1	I7312	I7314	300	0.014	838.9	838.7	Circular	4.00
LI7312-2	I7312	I7314	300	0.015	852.8	849.0	Natural	1.00
LI7314-1	I7314	I7336	23	0.014	838.7	837.7	Circular	4.00
LI7314-2	I7314	I7336	23	0.015	849.0	847.3	Natural	1.00
LI7336-1	I7336	I7400	65	0.014	837.7	837.1	Circular	4.00
LI7336-2	I7336	I7400	65	0.015	847.3	851.1	Natural	1.00
LI7400-1	I7400	I7541	143	0.014	837.1	836.7	Circular	4.00
LI7400-2	I7400	I7541	143	0.015	851.1	850.5	Natural	1.00
LI7403-1	I7403	I7503	177	0.014	848.3	847.4	Circular	2.00
LI7403-2	I7403	I7503	177	0.015	855.0	855.1	Natural	1.00
LI7420-1	I7420	I7312	98	0.014	842.9	842.4	Circular	2.00
LI7420-2	I7420	I7312	98	0.015	854.3	852.8	Natural	1.00
LI7428-1	I7428	I7312	151	0.014	839.4	838.9	Circular	3.50
LI7428-2	I7428	I7312	151	0.015	854.3	852.8	Natural	1.00
LI7503-1	I7503	I7517	131	0.014	847.2	846.3	Circular	2.00
LI7503-2	I7503	I7517	131	0.015	855.1	854.2	Natural	1.00
LI7517-1	I7517	I7528	36	0.014	846.3	846.4	Circular	2.00
LI7517-2	I7517	I7528	36	0.015	854.2	854.7	Natural	1.00
LI7528-1	I7528	I7538	37	0.014	842.2	842.0	Special	2.00
LI7528-2	I7528	I7538	37	0.015	854.7	855.3	Natural	1.00
LI7530-1	I7530	I7532	304	0.014	841.2	840.4	Circular	3.50
LI7530-2	I7530	I7532	304	0.015	855.2	856.4	Natural	1.00
LI7532-1	I7532	I7533	181	0.014	840.4	840.2	Circular	3.50
LI7532-2	I7532	I7533	181	0.015	856.4	855.8	Natural	1.00
LI7533-1	I7533	I7428	131	0.014	840.2	839.4	Circular	3.50
LI7533-2	I7533	I7428	131	0.015	855.8	854.3	Natural	1.00
LI7538-1	I7538	I7530	276	0.014	842.0	841.2	Circular	3.50
LI7538-2	I7538	I7530	276	0.015	855.3	855.2	Natural	1.00
LI7541-1	I7541	I7615	103	0.014	834.0	833.6	Circular	4.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LI7541-2	I7541	I7615	103	0.015	850.5	851.0	Natural	1.00
LI7549-1	I7549	I7420	124	0.014	843.7	842.9	Circular	2.00
LI7549-2	I7549	I7420	124	0.015	852.3	854.3	Natural	1.00
LI7553-1	I7553	I7549	280	0.014	845.1	844.1	Circular	1.25
LI7553-2	I7553	I7549	280	0.015	845.1	843.7	Natural	1.00
LI7615-1	I7615	DS12	23	0.014	745.7	745.3	Circular	9.00
LI7615-2	I7615	DS12	23	0.015	851.0	856.9	Natural	1.00
Link411	46_GA ALL	U25994	500	0.014	866.2	864.7	Circular	1.00
Link418	Node386	Node387	152	0.014	832.2	831.5	Circular	1.25
Link419	Node387	B5571	189	0.014	821.0	820.0	Circular	1.25
Link433	46TH-15	B5551	40	0.014	853.8	849.7	Circular	1.75
Link434	B5551	B5552	398	0.014	849.4	847.3	Circular	1.75
Link435	B5552	B5553	400	0.014	846.2	844.1	Circular	1.75
Link436	B5553	B5554	400	0.014	844.0	842.0	Circular	1.75
Link437	B5554	B5555	305	0.014	841.8	840.3	Circular	1.75
Link438	B5555	B5557	31	0.014	832.9	832.8	Circular	1.75
Link439	B5557	B5558	665	0.014	829.0	826.2	Circular	5.50
Link440	B5558	B5561	653	0.014	826.2	823.5	Circular	5.50
Link441	B5561	B5564	718	0.014	821.3	817.0	Circular	7.50
Link442	B5564	B5565	282	0.014	817.0	815.4	Circular	7.50
Link527	DS1(39th)	35TH_D	1304	0.015	837.1	843.3	Natural	0.50
LJ10015-11	J10015	J10018	44	0.014	853.2	853.0	Circular	1.50
LJ10015-12	J10015	J9941	12	0.014	852.8	852.8	Circular	1.50
LJ10015-21	J10015	J10018	44	0.015	858.6	858.8	Natural	1.00
LJ10015-22	J10015	J9941	12	0.015	858.6	858.8	Natural	1.00
LJ10016-2	J10016	J9986	160	0.015	858.8	858.3	Natural	1.00
LJ10016-3	J10016	J9986	160	0.014	852.3	851.3	Circular	1.50
LJ10017-1	J10017	J10015	9	0.014	853.3	853.2	Circular	1.50
LJ10017-2	J10017	J10015	9	0.015	859.3	858.6	Natural	1.00
LJ10018-1	J10018	J10016	112	0.014	853.0	852.3	Circular	1.50
LJ10018-2	J10018	J10016	112	0.015	858.8	858.8	Natural	1.00
LJ10019-1	J10019	J10017	163	0.014	853.8	853.3	Circular	1.25
LJ10019-2	J10019	J10017	163	0.015	859.3	859.3	Natural	1.00
LJ10021-1	J10021	J10022	44	0.014	854.3	854.2	Circular	1.25
LJ10021-2	J10021	J10022	44	0.015	860.3	860.3	Natural	1.00
LJ10022-1	J10022	J10019	122	0.014	854.2	853.8	Circular	1.25
LJ10022-2	J10022	J10019	122	0.015	860.3	859.3	Natural	1.00
LJ10025-1	J10025	J10021	160	0.014	859.4	854.3	Circular	1.00
LJ10025-2	J10025	J10021	160	0.015	865.3	860.3	Natural	1.00
LJ10030-1	J10030	J10025	186	0.014	865.3	859.4	Circular	1.00
LJ10030-2	J10030	J10025	186	0.015	870.3	865.3	Natural	1.00
LJ10074-1	J10074	J10018	28	0.014	852.9	852.5	Circular	2.00
LJ10074-2	J10074	J10018	28	0.015	858.0	858.8	Natural	1.00
LJ10106-1	J10106	J10074	109	0.014	853.2	852.9	Circular	2.00
LJ10106-2	J10106	J10074	109	0.015	856.6	858.0	Natural	1.00
LJ10110-1	J10110	J10106	4	0.014	853.2	853.2	Circular	2.00
LJ10110-2	J10110	J10106	4	0.015	856.6	856.6	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ10131-1	J10131	J9986	201	0.014	852.2	851.3	Circular	2.00
LJ10131-2	J10131	J9986	201	0.015	860.3	858.3	Natural	1.00
LJ10190-1	J10190	J10210	75	0.014	861.2	861.1	Circular	1.00
LJ10190-2	J10190	J10210	75	0.015	864.1	864.3	Natural	1.00
LJ10191-1	J10191	J9797	351	0.014	852.8	851.1	Circular	4.50
LJ10191-2	J10191	J9797	351	0.015	860.3	857.3	Natural	1.00
LJ10210-1	J10210	J10237	48	0.014	861.1	861.0	Circular	0.75
LJ10210-2	J10210	J10237	48	0.015	864.3	864.6	Natural	1.00
LJ10219-1	J10219	J10337	183	0.014	864.5	863.6	Circular	1.00
LJ10219-2	J10219	J10337	183	0.015	869.3	869.3	Natural	1.00
LJ10220-1	J10220	J10131	201	0.014	853.1	852.2	Circular	2.00
LJ10220-2	J10220	J10131	201	0.015	862.3	860.3	Natural	1.00
LJ10237-1	J10237	J10491	188	0.014	861.0	860.7	Circular	0.75
LJ10237-2	J10237	J10491	188	0.015	864.6	865.8	Natural	1.00
LJ10337-1	J10337	J10489	45	0.014	863.6	863.4	Circular	1.00
LJ10337-2	J10337	J10489	45	0.015	869.3	869.3	Natural	1.00
LJ10409-1	J10409	J10613	427	0.014	879.2	874.8	Circular	1.75
LJ10409-2	J10409	J10613	427	0.015	887.3	881.3	Natural	1.00
LJ10409-3	J10409	J11186	680	0.015	887.3	880.3	Natural	1.00
LJ10420-1	J10420	J10220	201	0.014	854.1	853.1	Circular	2.00
LJ10420-2	J10420	J10220	201	0.015	862.3	862.3	Natural	1.00
LJ10489-1	J10489	J10491	139	0.014	861.9	859.7	Circular	1.00
LJ10489-2	J10489	J10491	139	0.015	869.3	865.8	Natural	1.00
LJ10491-1	J10491	J10495	143	0.014	859.1	856.3	Circular	1.00
LJ10491-2	J10491	J10495	143	0.015	865.8	861.8	Natural	1.00
LJ10492-1	J10492	J10489	30	0.014	863.2	861.9	Circular	1.00
LJ10492-2	J10492	J10489	30	0.015	869.3	869.3	Natural	1.00
LJ10495-1	J10495	J10498	186	0.014	856.3	855.7	Circular	1.25
LJ10495-2	J10495	J10498	186	0.015	861.8	861.6	Natural	1.00
LJ10496-1	J10496	J10501	70	0.014	855.3	855.1	Circular	1.50
LJ10496-2	J10496	J10501	70	0.015	861.3	861.6	Natural	1.00
LJ10496-4	J10496	J10642	34	0.015	861.4	861.3	Natural	0.50
LJ10497-1	J10497	J10504	140	0.014	854.7	854.3	Circular	1.50
LJ10497-2	J10497	J10504	140	0.015	861.8	862.3	Natural	1.00
LJ10498-1	J10498	J10496	145	0.014	855.7	855.3	Circular	1.25
LJ10498-2	J10498	J10496	145	0.015	861.6	861.3	Natural	1.00
LJ10501-1	J10501	J10497	109	0.014	855.1	854.7	Circular	1.50
LJ10501-2	J10501	J10497	109	0.015	861.6	861.8	Natural	1.00
LJ10504-1	J10504	J10420	26	0.014	854.3	854.2	Circular	1.50
LJ10504-2	J10504	J10420	26	0.015	862.3	862.3	Natural	1.00
LJ10521-1	J10521	J10191	306	0.014	854.2	852.8	Circular	4.50
LJ10521-2	J10521	J10191	306	0.015	862.3	860.3	Natural	1.00
LJ10533-1	J10533	J10600	332	0.014	866.1	855.8	Circular	1.25
LJ10533-2	J10533	J10600	332	0.015	873.3	865.3	Natural	1.00
LJ10533-3	J10533	J11227	670	0.015	873.3	866.3	Natural	1.00
LJ10584-11	J10584	J10521	16	0.014	854.2	854.2	Circular	3.50
LJ10584-12	J10584	J10420	30	0.014	854.2	854.1	Circular	1.50

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ10584-21	J10584	J10521	16	0.015	862.3	862.3	Natural	1.00
LJ10584-22	J10584	J10420	30	0.015	862.3	862.3	Natural	1.00
LJ10600-1	J10600	J10521	50	0.014	855.8	854.2	Circular	1.50
LJ10600-2	J10600	J10521	50	0.015	865.3	862.3	Natural	1.00
LJ10613-1	J10613	J10632	314	0.014	874.8	862.6	Circular	1.75
LJ10613-2	J10613	J10632	314	0.015	881.3	869.3	Natural	1.00
LJ10613-3	J10613	J11159	640	0.015	881.3	880.3	Natural	1.00
LJ10614-1	J10614	J10409	416	0.014	880.3	879.2	Circular	2.00
LJ10614-2	J10614	J10409	416	0.015	885.3	887.3	Natural	1.00
LJ10621-1	J10621	J10614	28	0.014	880.7	880.3	Circular	2.00
LJ10621-2	J10621	J10614	28	0.015	885.3	885.3	Natural	1.00
LJ10621-3	J10621	J11163	640	0.015	885.3	881.3	Natural	1.00
LJ10629-1	J10629	J10642	326	0.014	856.2	855.0	Circular	3.00
LJ10629-2	J10629	J10642	326	0.015	862.3	861.3	Natural	1.00
LJ10629-3	J10629	J9952	654	0.015	862.3	860.3	Natural	1.00
LJ10632-1	J10632	J10629	335	0.014	862.6	856.9	Circular	1.75
LJ10632-2	J10632	J10629	335	0.015	869.3	862.3	Natural	1.00
LJ10636-1	J10636	J10584	287	0.014	854.8	854.2	Circular	3.50
LJ10636-2	J10636	J10584	287	0.015	861.8	862.3	Natural	1.00
LJ10642-1	J10642	J10636	28	0.014	855.0	854.8	Circular	3.50
LJ10642-2	J10642	J10636	28	0.015	861.3	861.8	Natural	1.00
LJ10642-3	J10496	J10110	510	0.015	861.3	856.7	Natural	1.00
LJ10725-1	J10725	J10584	34	0.014	854.4	854.2	Circular	1.50
LJ10725-2	J10725	J10584	34	0.015	862.3	862.3	Natural	1.00
LJ10775-1	J10775	J10725	203	0.014	855.7	854.4	Circular	1.50
LJ10775-2	J10775	J10725	203	0.015	863.3	862.3	Natural	1.00
LJ10810-1	J10810	J10521	328	0.014	856.5	854.7	Circular	3.50
LJ10810-2	J10810	J10521	328	0.015	863.8	862.3	Natural	1.00
LJ10842-1	J10842	J10775	193	0.014	856.8	855.7	Circular	1.50
LJ10842-2	J10842	J10775	193	0.015	864.3	863.3	Natural	1.00
LJ10967-1	J10967	J10842	204	0.014	858.0	856.8	Circular	1.50
LJ10967-2	J10967	J10842	204	0.015	865.3	864.3	Natural	1.00
LJ11079-1	J11079	J10967	21	0.014	858.2	858.0	Circular	1.50
LJ11079-2	J11079	J10967	21	0.015	865.4	865.3	Natural	1.00
LJ11109-1	J11109	J10810	327	0.014	858.2	856.5	Circular	3.50
LJ11109-2	J11109	J10810	327	0.015	865.3	863.8	Natural	1.00
LJ11159-1	J11159	J11170	334	0.014	873.3	870.3	Circular	2.25
LJ11159-2	J11159	J11170	334	0.015	880.3	876.3	Natural	1.00
LJ11160-1	J11160	J11186	396	0.014	876.2	875.0	Circular	2.00
LJ11160-2	J11160	J11186	396	0.015	880.4	880.3	Natural	1.00
LJ11163-1	J11163	J11160	23	0.014	876.4	876.2	Circular	2.00
LJ11163-2	J11163	J11160	23	0.015	881.3	880.3	Natural	1.00
LJ11170-1	J11170	J11176	315	0.014	870.3	868.6	Circular	2.50
LJ11170-2	J11170	J11176	315	0.015	876.3	875.3	Natural	1.00
LJ11176-1	J11176	J11211	332	0.014	868.6	864.1	Circular	2.50
LJ11176-2	J11176	J11211	332	0.015	875.3	871.3	Natural	1.00
LJ11176-3	J11176	J10629	640	0.015	875.3	862.3	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ11186-1	J11186	J11187	46	0.014	875.0	874.9	Circular	2.00
LJ11186-2	J11186	J11187	46	0.015	880.4	880.3	Natural	1.00
LJ11187-1	J11187	J11159	394	0.014	874.9	873.3	Circular	2.25
LJ11187-2	J11187	J11159	394	0.015	880.4	880.3	Natural	1.00
LJ11211-1	J11211	J11213	205	0.014	864.1	860.6	Circular	2.50
LJ11211-2	J11211	J11213	205	0.015	871.3	867.3	Natural	1.00
LJ11211-3	J11211	J10642	642	0.015	871.3	861.3	Natural	1.00
LJ11213-1	J11213	J11220	107	0.014	860.6	858.7	Circular	2.50
LJ11213-2	J11213	J11220	107	0.015	867.3	865.3	Natural	1.00
LJ11220-1	J11220	J11109	23	0.014	858.7	858.2	Circular	2.50
LJ11220-2	J11220	J11109	23	0.015	865.4	865.3	Natural	1.00
LJ11226-1	J11226	J11228	38	0.014	863.1	862.4	Circular	2.00
LJ11226-2	J11226	J11228	38	0.015	867.4	867.3	Natural	1.00
LJ11227-1	J11227	J11232	298	0.014	861.1	859.9	Circular	3.00
LJ11227-2	J11227	J11232	298	0.015	866.3	865.3	Natural	1.00
LJ11228-1	J11228	J11230	292	0.014	862.4	861.8	Circular	2.00
LJ11228-2	J11228	J11230	292	0.015	867.3	866.3	Natural	1.00
LJ11230-1	J11230	J11227	28	0.014	861.8	861.5	Circular	2.00
LJ11230-2	J11230	J11227	28	0.015	866.4	866.3	Natural	1.00
LJ11315-1	J11315	J11227	25	0.014	861.8	861.1	Circular	2.00
LJ11315-2	J11315	J11227	25	0.015	866.4	866.3	Natural	1.00
LJ11456-1	J11456	J11315	301	0.014	862.9	861.8	Circular	2.00
LJ11456-2	J11456	J11315	301	0.015	867.3	866.3	Natural	1.00
LJ11572-1	J11572	J11456	297	0.014	864.2	862.9	Circular	2.00
LJ11572-2	J11572	J11456	297	0.015	868.3	867.3	Natural	1.00
LJ11637-1	J11637	J11572	19	0.014	864.9	864.2	Circular	2.00
LJ11637-2	J11637	J11572	19	0.015	868.3	868.3	Natural	1.00
LJ2704-1	J11220	J11079	24	0.014	858.3	858.2	Circular	1.00
LJ2704-2	J11220	J11079	24	0.015	865.4	865.3	Natural	1.00
LJ2705-1	J11232	J11109	38	0.014	858.2	858.2	Circular	3.00
LJ2705-2	J11232	J11109	38	0.015	865.4	865.3	Natural	1.00
LJ2722-1	J9941	J9934	145	0.014	852.6	851.7	Circular	3.00
LJ2722-2	J9941	J9934	145	0.015	858.8	858.3	Natural	1.00
LJ2723-1	J9934	J9874	166	0.014	851.7	850.7	Circular	3.00
LJ2723-2	J9934	J9874	166	0.015	858.4	858.3	Natural	1.00
LJ2739-1	J7735	J7576	251	0.014	865.1	851.7	Circular	2.50
LJ2739-2	J7735	J7576	251	0.015	872.9	864.8	Natural	1.00
LJ2740-1	J6915	J6908	298	0.014	819.9	818.9	Circular	1.50
LJ2740-2	J6915	J6908	298	0.015	826.9	837.8	Natural	1.00
LJ2741-1	J6908	J6851	52	0.014	818.9	818.8	Circular	1.50
LJ2741-2	J6908	J6851	52	0.015	837.8	830.6	Natural	1.00
LJ2777-1	J6759	J6769	33	0.014	802.2	802.1	Circular	8.50
LJ2777-2	J6759	J6769	33	0.015	830.4	830.4	Natural	1.00
LJ2790-1	JDOT2	MHNB188-2	418	0.014	829.3	826.4	Circular	3.00
LJ2790-2	JDOT2	MHNB188-2	418	0.015	836.9	840.1	Natural	1.00
LJ2791-1	MHNB188-2	CBLN89-1	180	0.014	825.8	824.6	Circular	3.50
LJ2791-2	MHNB188-2	CBLN89-1	180	0.015	840.1	840.7	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ2792-1	MH17-10-2	MHLN81-3	233	0.014	818.4	817.0	Circular	4.00
LJ2792-2	MH17-10-2	MHLN81-3	233	0.015	827.6	828.5	Natural	1.00
LJ2793-1	MHLN81-3	MHHN79-3	198	0.014	817.0	815.8	Circular	4.00
LJ2793-2	MHLN81-3	MHHN79-3	198	0.015	828.5	829.0	Natural	1.00
LJ2794-1	MHHN79-3	CBLN78-1	112	0.014	815.8	814.6	Circular	4.00
LJ2794-2	MHHN79-3	CBLN78-1	112	0.015	829.0	830.2	Natural	1.00
LJ2795-1	CBLN78-1	JDOT3	572	0.014	814.6	805.4	Circular	4.00
LJ2795-2	CBLN78-1	JDOT3	572	0.015	830.2	818.7	Natural	1.00
LJ2798-1	CBLN89-1	MH17-10-2	566	0.014	824.6	818.9	Circular	3.50
LJ2798-2	CBLN89-1	MH17-10-2	566	0.015	840.7	827.6	Natural	1.00
LJ2799-1	JMPRB2	JMPRB1	482	0.014	811.3	808.9	Circular	4.00
LJ2799-2	JMPRB2	JMPRB1	482	0.015	820.5	818.0	Natural	1.00
LJ2800-1	JMPRB1	JDUNWOODY	170	0.014	808.4	808.2	Special	4.50
LJ2800-2	JMPRB1	JDUNWOODY	170	0.015	818.0	815.3	Natural	1.00
LJ2801-1	JDUNWOODY	TRANS	120	0.014	808.2	808.1	Special	4.50
LJ2801-2	JDUNWOODY	TRANS	120	0.015	815.3	816.0	Natural	1.00
LJ2802-1	MH5	J6320	253	0.014	806.3	805.9	Circular	6.00
LJ2802-2	MH5	J6320	253	0.015	821.0	825.4	Natural	1.00
LJ2803-1	TRANS	MH5	330	0.014	806.6	806.3	Circular	6.00
LJ2803-2	TRANS	MH5	330	0.015	816.0	821.0	Natural	1.00
LJ2804-1	J6595	J6677	154	0.014	804.6	804.4	Circular	7.00
LJ2804-2	J6595	J6677	154	0.015	828.6	828.6	Natural	1.00
LJ2805-1	JDOT3	J6721	120	0.014	803.7	803.5	Circular	7.50
LJ2805-2	JDOT3	J6721	120	0.015	818.7	833.0	Natural	1.00
LJ2806-1	JDOT4	CBLN78-1	130	0.014	818.7	815.1	Circular	3.50
LJ2806-2	JDOT4	CBLN78-1	130	0.015	826.3	830.2	Natural	1.00
LJ3251-1	J3251	J4891	32	0.014	843.7	843.6	Circular	2.00
LJ3251-2	J3251	J4891	32	0.015	852.3	851.1	Natural	1.00
LJ4567-1	J4567	J4745	323	0.014	849.6	848.5	Circular	1.00
LJ4567-2	J4567	J4745	323	0.015	854.3	855.3	Natural	1.00
LJ4596-1	J4596	J4663	114	0.014	843.1	842.2	Circular	1.25
LJ4596-2	J4596	J4663	114	0.015	847.3	846.3	Natural	1.00
LJ4597-1	J4597	J4859	350	0.014	846.9	844.8	Circular	1.50
LJ4597-2	J4597	J4859	350	0.015	851.8	849.4	Natural	1.00
LJ4663-1	J4663	J4734	252	0.014	840.3	837.9	Circular	1.25
LJ4663-2	J4663	J4734	252	0.015	846.3	844.3	Natural	1.00
LJ4734-1	J4734	J4764	63	0.014	837.9	837.2	Circular	2.50
LJ4734-2	J4734	J4764	63	0.015	844.3	844.1	Natural	1.00
LJ4745-1	J4745	J5104	350	0.014	848.5	845.1	Circular	1.00
LJ4745-2	J4745	J5104	350	0.015	855.3	852.3	Natural	1.00
LJ4764-1	J4764	J4937	336	0.014	837.2	836.2	Circular	2.50
LJ4764-2	J4764	J4937	336	0.015	844.1	843.3	Natural	1.00
LJ4859-1	J4859	J3251	328	0.014	844.6	843.7	Circular	2.00
LJ4859-2	J4859	J3251	328	0.015	849.4	852.3	Natural	1.00
LJ4891-1	J4891	J5085	172	0.014	843.7	842.9	Circular	2.00
LJ4891-2	J4891	J5085	172	0.015	851.1	846.3	Natural	1.00
LJ4937-1	J4937	J5236	358	0.014	836.2	835.3	Circular	3.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ4937-2	J4937	J5236	358	0.015	843.3	842.8	Natural	1.00
LJ4977-1	J4977	J5004	34	0.014	846.0	845.7	Circular	1.00
LJ4977-2	J4977	J5004	34	0.015	852.8	852.3	Natural	1.00
LJ5004-1	J5004	J5271	340	0.014	845.7	838.4	Circular	1.00
LJ5004-2	J5004	J5271	340	0.015	852.3	843.8	Natural	1.00
LJ5085-1	J5085	J5285	243	0.014	842.9	835.2	Circular	2.00
LJ5085-2	J5085	J5285	243	0.015	846.3	841.8	Natural	1.00
LJ5104-1	J5104	J5168	74	0.014	845.1	844.9	Circular	1.00
LJ5104-2	J5104	J5168	74	0.015	852.3	851.8	Natural	1.00
LJ5168-1	J5168	J5205	105	0.014	845.0	843.0	Circular	1.00
LJ5168-2	J5168	J5205	105	0.015	851.8	850.3	Natural	1.00
LJ5205-1	J5205	J5293	218	0.014	837.9	837.0	Circular	1.50
LJ5205-2	J5205	J5293	218	0.015	850.3	843.8	Natural	1.00
LJ5207-1	J5207	J5209	31	0.014	109.1	103.7	Circular	1.75
LJ5207-2	J5207	J5209	10	0.015	0.1	0.0	Natural	1.00
LJ5209-1	J5209	J5475	227	0.014	0.0	0.0	Circular	1.75
LJ5209-2	J5209	J5475	10	0.015	0.1	0.0	Natural	1.00
LJ5212-1	J5212	J5207	263	0.014	119.5	109.1	Circular	1.25
LJ5212-2	J5212	J5207	10	0.015	0.1	0.0	Natural	1.00
LJ5228-1	J5228	J5236	31	0.014	836.5	835.3	Circular	1.00
LJ5228-2	J5228	J5236	31	0.015	843.1	842.8	Natural	1.00
LJ5236-1	J5236	J5259	50	0.014	835.3	833.0	Circular	2.50
LJ5236-2	J5236	J5259	50	0.015	842.8	842.0	Natural	1.00
LJ5259-1	J5259	J5325	127	0.014	833.0	832.6	Circular	2.50
LJ5259-2	J5259	J5325	127	0.015	842.0	841.5	Natural	1.00
LJ5271-1	J5271	J5293	43	0.014	838.4	837.0	Circular	1.25
LJ5271-2	J5271	J5293	43	0.015	843.8	843.8	Natural	1.00
LJ5285-1	J5285	J5411	77	0.014	834.6	833.2	Special	2.00
LJ5285-2	J5285	J5411	77	0.015	841.8	840.3	Natural	1.00
LJ5293-1	J5293	J5363	36	0.014	836.7	836.4	Circular	1.50
LJ5293-2	J5293	J5363	36	0.015	843.8	843.6	Natural	1.00
LJ5323-1	J5323	J5228	307	0.014	842.0	836.5	Circular	1.00
LJ5323-2	J5323	J5228	307	0.015	849.1	843.1	Natural	1.00
LJ5325-1	J5325	J5415	52	0.014	832.6	832.5	Circular	2.50
LJ5325-2	J5325	J5415	52	0.015	841.5	841.3	Natural	1.00
LJ5363-1	J5363	J5648	316	0.014	835.4	832.5	Circular	1.50
LJ5363-2	J5363	J5648	316	0.015	843.6	838.4	Natural	1.00
LJ5411-1	J5411	J5707	328	0.014	832.7	829.7	Circular	2.25
LJ5411-2	J5411	J5707	328	0.015	840.3	836.3	Natural	1.00
LJ5415-1	J5415	J5516	171	0.014	832.5	831.7	Circular	2.50
LJ5415-2	J5415	J5516	171	0.015	841.8	840.5	Natural	1.00
LJ5461-1	J5461	J5516	68	0.014	834.4	833.7	Circular	1.00
LJ5461-2	J5461	J5516	68	0.015	841.2	840.5	Natural	1.00
LJ5475-1	J5475	J5507	35	0.014	0.0	0.0	Circular	1.75
LJ5475-2	J5475	J5507	10	0.015	0.1	0.0	Natural	1.00
LJ5507-1	J5507	J5517	13	0.014	0.0	0.0	Circular	1.75
LJ5507-2	J5507	J5517	10	0.015	0.1	0.0	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ5516-1	J5516	J5580	84	0.014	831.7	831.3	Circular	3.00
LJ5516-2	J5516	J5580	84	0.015	840.5	839.7	Natural	1.00
LJ5517-1	J5517	J5531	16	0.014	0.0	0.0	Circular	1.75
LJ5517-2	J5517	J5531	10	0.015	0.1	0.0	Natural	1.00
LJ5537-1	J5537	J5540	25	0.014	833.6	833.3	Circular	1.50
LJ5537-2	J5537	J5540	25	0.015	839.6	839.3	Natural	1.00
LJ5540-1	J5540	J5628	162	0.014	832.3	831.0	Circular	1.50
LJ5540-2	J5540	J5628	162	0.015	839.3	837.3	Natural	1.00
LJ5580-1	J5580	J5702	194	0.014	831.3	829.7	Circular	3.00
LJ5580-2	J5580	J5702	194	0.015	839.7	843.3	Natural	1.00
LJ5628-1	J5628	J5752	248	0.014	831.0	829.0	Circular	1.50
LJ5628-2	J5628	J5752	248	0.015	837.3	835.3	Natural	1.00
LJ5648-1	J5648	J5696	44	0.014	832.0	831.4	Special	1.75
LJ5648-2	J5648	J5696	44	0.015	838.4	838.2	Natural	1.00
LJ5648-3	J5648	J6131	510	0.015	838.4	832.2	Natural	1.00
LJ5683-1	J5683	J5860	203	0.014	834.4	829.0	Circular	2.00
LJ5683-2	J5683	J5860	203	0.015	841.4	836.3	Natural	1.00
LJ5696-1	J5696	J5926	260	0.014	831.4	827.9	Circular	1.75
LJ5696-2	J5696	J5926	260	0.015	838.2	833.1	Natural	1.00
LJ5702-1	J5702	J5905	269	0.014	829.7	828.6	Circular	3.00
LJ5702-2	J5702	J5905	269	0.015	843.3	854.3	Natural	1.00
LJ5707-1	J5707	J5752	54	0.014	829.7	829.1	Circular	2.25
LJ5707-2	J5707	J5752	54	0.015	836.3	835.3	Natural	1.00
LJ5752-1	J5752	J5935	337	0.014	828.4	820.2	Circular	2.00
LJ5752-2	J5752	J5935	337	0.015	835.3	831.3	Natural	1.00
LJ5758-1	J5758	J5826	68	0.014	830.2	829.9	Circular	3.00
LJ5758-2	J5758	J5826	68	0.015	853.0	862.0	Natural	1.00
LJ5775-1	J5775	J5891	121	0.014	843.2	840.6	Circular	1.00
LJ5775-2	J5775	J5891	121	0.015	846.6	846.6	Natural	1.00
LJ5826-1	J5826	J5905	149	0.014	829.9	828.6	Circular	2.75
LJ5826-2	J5826	J5905	149	0.015	862.0	854.3	Natural	1.00
LJ5860-1	J5860	J6025	175	0.014	829.0	827.9	Circular	2.50
LJ5860-2	J5860	J6025	175	0.015	836.3	836.3	Natural	1.00
LJ5891-1	J5891	J6011	109	0.014	840.6	839.5	Circular	1.50
LJ5891-2	J5891	J6011	109	0.015	846.6	845.8	Natural	1.00
LJ5905-1	J5905	J5965	268	0.014	828.6	826.4	Circular	2.75
LJ5905-2	J5905	J5965	268	0.015	854.3	840.3	Natural	1.00
LJ5926-1	J5926	J5965	24	0.014	827.9	827.4	Circular	1.75
LJ5926-2	J5926	J5965	24	0.015	833.1	840.3	Natural	1.00
LJ5935-1	J5935	JDOT4	240	0.014	820.2	818.9	Circular	2.50
LJ5935-2	J5935	JDOT4	240	0.015	831.3	826.3	Natural	1.00
LJ5965-1	J5965	J6131	378	0.014	826.4	823.5	Circular	3.00
LJ5965-2	J5965	J6131	378	0.015	840.3	832.2	Natural	1.00
LJ5997-1	J5997	J6011	52	0.014	838.0	837.0	Circular	2.00
LJ5997-2	J5997	J6011	52	0.015	845.7	845.8	Natural	1.00
LJ6011-1	J6011	J6120	155	0.014	835.9	834.9	Special	1.88
LJ6011-2	J6011	J6120	155	0.015	845.8	842.9	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ6025-1	J6025	J6079	71	0.014	827.9	827.5	Circular	2.50
LJ6025-2	J6025	J6079	71	0.015	836.3	836.3	Natural	1.00
LJ6068-1	J6068	J6164	150	0.014	845.3	844.1	Circular	1.00
LJ6068-2	J6068	J6164	150	0.015	850.3	850.3	Natural	1.00
LJ6075-1	J6075	J5997	181	0.014	840.5	838.0	Circular	2.00
LJ6075-2	J6075	J5997	181	0.015	848.2	845.7	Natural	1.00
LJ6079-1	J6079	J6211	142	0.014	827.5	827.2	Circular	2.50
LJ6079-2	J6079	J6211	142	0.015	836.3	837.3	Natural	1.00
LJ6120-1	J6120	J6233	131	0.014	834.9	833.5	Circular	2.25
LJ6120-2	J6120	J6233	131	0.015	842.9	840.1	Natural	1.00
LJ6131-1	J6131	J6467	263	0.014	823.5	820.9	Circular	3.00
LJ6131-2	J6131	J6467	263	0.015	832.2	827.1	Natural	1.00
LJ6143-1	J6143	J6075	173	0.014	842.9	840.5	Circular	2.00
LJ6143-2	J6143	J6075	173	0.015	850.3	848.2	Natural	1.00
LJ6164-1	J6164	J6143	39	0.014	844.1	843.7	Circular	1.50
LJ6164-2	J6164	J6143	39	0.015	850.3	850.3	Natural	1.00
LJ6211-1	J6211	J6483	194	0.014	827.2	826.8	Circular	2.50
LJ6211-2	J6211	J6483	194	0.015	837.3	838.3	Natural	1.00
LJ6231-1	J6231	J6227	9	0.014	0.0	0.0	Circular	3.00
LJ6231-2	J6231	J6227	10	0.015	0.1	0.0	Natural	1.00
LJ6233-1	J6233	J6392	115	0.014	833.5	832.9	Circular	2.25
LJ6233-2	J6233	J6392	115	0.015	840.2	840.1	Natural	1.00
LJ6237-1	J6237	JDOT4	198	0.014	821.6	818.7	Circular	3.00
LJ6237-2	J6237	JDOT4	198	0.015	829.3	826.3	Natural	1.00
LJ6291-1	J6291	J6231	55	0.014	0.0	0.0	Circular	3.00
LJ6291-2	J6291	J6231	10	0.015	0.1	0.0	Natural	1.00
LJ6320-1	J6320	J6469	100	0.014	805.9	805.8	Circular	6.00
LJ6320-2	J6320	J6469	100	0.015	825.4	825.4	Natural	1.00
LJ6366-1	J6366	J6291	72	0.014	0.0	0.0	Circular	3.00
LJ6366-2	J6366	J6291	10	0.015	0.1	0.0	Natural	1.00
LJ6392-1	J6392	J6501	70	0.014	832.9	831.8	Circular	2.25
LJ6392-2	J6392	J6501	70	0.015	840.1	839.3	Natural	1.00
LJ6408-1	J6408	J6366	55	0.014	0.0	0.0	Circular	3.00
LJ6408-2	J6408	J6366	10	0.015	0.1	0.0	Natural	1.00
LJ6450-1	J6450	J6469	211	0.014	809.9	808.2	Circular	3.00
LJ6450-2	J6450	J6469	211	0.015	821.3	825.4	Natural	1.00
LJ6463-1	J6463	J6450	51	0.014	810.0	809.9	Circular	3.00
LJ6463-2	J6463	J6450	51	0.015	820.3	821.3	Natural	1.00
LJ6467-1	J6467	J6822	410	0.014	817.1	815.4	Circular	5.00
LJ6467-2	J6467	J6822	410	0.015	827.1	824.7	Natural	1.00
LJ6468-1	J6468	J6463	277	0.014	811.4	810.4	Circular	3.00
LJ6468-2	J6468	J6463	277	0.015	819.3	820.3	Natural	1.00
LJ6469-1	J6469	J6595	100	0.014	804.7	804.6	Circular	7.00
LJ6469-2	J6469	J6595	100	0.015	825.4	828.6	Natural	1.00
LJ6471-1	J6471	J6467	150	0.014	822.0	821.2	Circular	3.50
LJ6471-2	J6471	J6467	150	0.015	829.3	827.1	Natural	1.00
LJ6477-1	J6477	J6471	265	0.014	823.5	822.0	Circular	3.50

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ6477-2	J6477	J6471	265	0.015	830.3	829.3	Natural	1.00
LJ6483-1	J6483	J6477	345	0.014	826.8	823.5	Circular	3.50
LJ6483-2	J6483	J6477	345	0.015	838.3	830.3	Natural	1.00
LJ6495-1	J6495	J6483	64	0.014	828.6	827.9	Circular	3.00
LJ6495-2	J6495	J6483	64	0.015	838.3	838.3	Natural	1.00
LJ6501-1	J6501	J6495	316	0.014	830.9	828.6	Circular	3.00
LJ6501-2	J6501	J6495	316	0.015	839.3	838.3	Natural	1.00
LJ6507-1	J6507	J6501	67	0.014	831.9	831.8	Circular	1.50
LJ6507-2	J6507	J6501	67	0.015	839.3	839.3	Natural	1.00
LJ6517-1	J6517	J6468	44	0.014	812.8	812.4	Circular	2.25
LJ6517-2	J6517	J6468	44	0.015	819.4	819.3	Natural	1.00
LJ6518-1	J6518	J6408	79	0.014	0.0	0.0	Circular	3.00
LJ6518-2	J6518	J6408	10	0.015	0.1	0.0	Natural	1.00
LJ6521-1	J6521	J6518	190	0.014	114.0	111.0	Circular	3.00
LJ6521-2	J6521	J6518	10	0.015	0.1	0.0	Natural	1.00
LJ6677-1	J6677	JDOT3	86	0.014	804.4	804.2	Circular	7.00
LJ6677-2	J6677	JDOT3	86	0.015	828.6	818.7	Natural	1.00
LJ6698-1	J6698	J6517	219	0.014	816.9	812.8	Circular	2.00
LJ6698-2	J6698	J6517	219	0.015	826.3	819.3	Natural	1.00
LJ6705-1	J6705	J6521	235	0.014	0.0	0.0	Circular	3.00
LJ6705-2	J6705	J6521	10	0.015	0.1	0.0	Natural	1.00
LJ6721-1	J6721	J6759	198	0.014	802.5	802.2	Circular	8.50
LJ6721-2	J6721	J6759	198	0.015	833.0	830.4	Natural	1.00
LJ6762-1	J6762	J6698	102	0.014	818.8	816.9	Circular	2.00
LJ6762-2	J6762	J6698	102	0.015	828.3	826.3	Natural	1.00
LJ6769-1	J6769	J7010	192	0.014	802.1	801.8	Circular	8.50
LJ6769-2	J6769	J7010	192	0.015	830.4	823.6	Natural	1.00
LJ6806-1	J6806	J6904	75	0.014	835.4	834.6	Circular	3.00
LJ6806-2	J6806	J6904	75	0.015	842.3	842.3	Natural	1.00
LJ6810-1	J6810	J6806	259	0.014	840.8	837.9	Circular	2.75
LJ6810-2	J6810	J6806	259	0.015	846.3	842.3	Natural	1.00
LJ6811-1	J6811	J6810	58	0.014	841.9	841.1	Circular	2.75
LJ6811-2	J6811	J6810	58	0.015	849.3	846.3	Natural	1.00
LJ6822-1	J6822	J7092	247	0.014	815.4	814.6	Circular	5.00
LJ6822-2	J6822	J7092	247	0.015	824.7	823.3	Natural	1.00
LJ6822-4	J6822	J7009	33	0.015	824.7	825.3	Natural	0.50
LJ6851-1	J6851	J6677	146	0.014	817.5	815.2	Circular	3.00
LJ6851-2	J6851	J6677	146	0.015	830.6	828.6	Natural	1.00
LJ6871-1	J6871	J6997	294	0.014	828.9	828.2	Circular	3.50
LJ6871-2	J6871	J6997	294	0.015	835.3	839.3	Natural	1.00
LJ6876-1	J6876	J6871	52	0.014	829.1	828.9	Circular	3.50
LJ6876-2	J6876	J6871	52	0.015	835.3	835.3	Natural	1.00
LJ6883-1	J6883	J6892	59	0.014	833.4	832.5	Circular	3.00
LJ6883-2	J6883	J6892	59	0.015	839.3	839.3	Natural	1.00
LJ6892-1	J6892	J6876	333	0.014	832.5	830.0	Circular	3.00
LJ6892-2	J6892	J6876	333	0.015	839.3	835.3	Natural	1.00
LJ6904-1	J6904	J6883	331	0.014	834.6	833.4	Circular	3.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ6904-2	J6904	J6883	331	0.015	842.3	839.3	Natural	1.00
LJ6963-1	J6963	J6721	129	0.014	827.8	825.9	Circular	1.50
LJ6963-2	J6963	J6721	129	0.015	834.5	833.0	Natural	1.00
LJ6997-1	J6997	LORINGPK	300	0.014	828.0	827.2	Circular	3.50
LJ6997-2	J6997	LORINGPK	300	0.015	839.3	835.5	Natural	1.00
LJ6999-1	J6999	J6762	119	0.014	825.9	820.9	Circular	1.75
LJ6999-2	J6999	J6762	119	0.015	836.3	828.3	Natural	1.00
LJ7000-1	J7000	J7032	365	0.014	874.0	867.0	Circular	1.25
LJ7000-2	J7000	J7032	365	0.015	875.3	872.8	Natural	1.00
LJ7009-1	J7009	7009A	118	0.014	815.8	812.9	Circular	4.00
LJ7009-2	J7009	7009A	118	0.015	825.3	823.6	Natural	1.00
LJ7010-1	J7010	J7028	45	0.014	800.8	800.7	Circular	10.00
LJ7010-2	J7010	J7028	45	0.015	823.6	823.6	Natural	1.00
LJ7019(2)	J7019	J7009	155	0.014	820.0	818.8	Circular	3.00
LJ7019-11	J7019	J7010	30	0.014	814.6	814.3	Circular	6.00
LJ7019-21	J7019	J7010	30	0.015	823.7	823.6	Natural	1.00
LJ7021-1	J7021	J6851	99	0.014	817.5	815.2	Circular	3.00
LJ7021-2	J7021	J6851	99	0.015	846.3	830.6	Natural	1.00
LJ7027-1	J7027	J7019	22	0.014	814.9	814.6	Circular	6.00
LJ7027-2	J7027	J7019	22	0.015	830.8	823.6	Natural	1.00
LJ7028-1	J7028	J7073	346	0.014	800.7	799.9	Circular	10.00
LJ7028-2	J7028	J7073	346	0.015	823.6	823.5	Natural	1.00
LJ7032-1	J7032	J7053	263	0.014	866.9	861.7	Circular	1.50
LJ7032-2	J7032	J7053	263	0.015	872.8	868.3	Natural	1.00
LJ7038-1	J7038	J6999	81	0.014	839.0	831.9	Circular	1.75
LJ7038-2	J7038	J6999	81	0.015	845.2	836.3	Natural	1.00
LJ7051-1	J7051	J7027	66	0.014	821.9	821.5	Circular	6.00
LJ7051-2	J7051	J7027	66	0.015	831.3	830.8	Natural	1.00
LJ7053-1	J7053	J7067	54	0.014	861.7	861.0	Circular	1.50
LJ7053-2	J7053	J7067	54	0.015	868.3	866.3	Natural	1.00
LJ7062-1	J7062	J7051	37	0.014	822.2	821.9	Circular	6.00
LJ7062-2	J7062	J7051	37	0.015	832.9	831.3	Natural	1.00
LJ7067-1	J7067	J7070	59	0.014	855.0	852.4	Circular	1.50
LJ7067-2	J7067	J7070	59	0.015	866.3	861.5	Natural	1.00
LJ7070-1	J7070	J7038	100	0.014	850.9	840.0	Circular	1.50
LJ7070-2	J7070	J7038	100	0.015	861.5	845.2	Natural	1.00
LJ7073-1	J7073	J7092	414	0.014	799.9	798.9	Circular	10.00
LJ7073-2	J7073	J7092	414	0.015	823.5	823.3	Natural	1.00
LJ7084-1	J7084	J7021	148	0.014	837.7	824.1	Circular	2.75
LJ7084-2	J7084	J7021	148	0.015	843.1	846.3	Natural	1.00
LJ7092-1	J7092	LORINGPK	244	0.014	798.9	798.1	Circular	10.00
LJ7092-2	J7092	LORINGPK	244	0.015	823.3	835.5	Natural	1.00
LJ7108-1	J7108	J7084	27	0.014	840.2	837.7	Circular	2.75
LJ7108-2	J7108	J7084	27	0.015	851.3	843.1	Natural	1.00
LJ7134-1	J7134	J7180	208	0.014	824.9	824.7	Circular	1.00
LJ7134-2	J7134	J7180	208	0.015	833.3	833.3	Natural	1.00
LJ7153-1	J7153	J7062	107	0.014	825.4	823.5	Circular	6.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ7153-2	J7153	J7062	107	0.015	836.9	832.9	Natural	1.00
LJ7175-1	J7175	J6963	289	0.014	842.4	827.8	Circular	1.00
LJ7175-2	J7175	J6963	289	0.015	849.5	834.5	Natural	1.00
LJ7180-1	J7180	J7092	104	0.014	824.6	820.0	Circular	2.00
LJ7180-2	J7180	J7092	104	0.015	833.3	823.3	Natural	1.00
LJ7242-1	J7242	J7180	142	0.014	825.7	824.8	Circular	2.00
LJ7242-2	J7242	J7180	142	0.015	835.8	833.3	Natural	1.00
LJ7277-1	J7277	J7242	114	0.014	825.7	825.7	Circular	2.00
LJ7277-2	J7277	J7242	114	0.015	835.8	835.8	Natural	1.00
LJ7292-1	J7292	J7277	16	0.014	826.0	825.7	Circular	2.00
LJ7292-2	J7292	J7277	16	0.015	836.3	835.8	Natural	1.00
LJ7301-1	J7301	J7153	81	0.014	828.8	827.3	Circular	6.00
LJ7301-2	J7301	J7153	81	0.015	837.0	836.9	Natural	1.00
LJ7325-1	J7325	J7301	19	0.014	829.1	828.8	Circular	6.00
LJ7325-2	J7325	J7301	19	0.015	841.0	836.9	Natural	1.00
LJ7361-1	J7361	J7372	399	0.014	840.3	840.3	Circular	1.50
LJ7361-2	J7361	J7372	399	0.015	845.4	845.3	Natural	1.00
LJ7361-3	J7361	J6883	431	0.015	845.4	839.3	Natural	1.00
LJ7363-1	J7363	J7325	67	0.014	831.6	831.2	Circular	6.00
LJ7363-2	J7363	J7325	67	0.015	841.1	841.0	Natural	1.00
LJ7366-1	J7366	J7108	163	0.014	848.7	840.5	Circular	2.50
LJ7366-2	J7366	J7108	163	0.015	857.6	851.3	Natural	1.00
LJ7368-1	J7368	J7292	89	0.014	826.1	826.0	Circular	1.75
LJ7368-2	J7368	J7292	89	0.015	836.3	836.3	Natural	1.00
LJ7372-1	J7372	J7377	399	0.014	838.0	833.3	Circular	1.75
LJ7372-2	J7372	J7377	399	0.015	845.3	840.3	Natural	1.00
LJ7377-1	J7377	J7368	237	0.014	833.3	826.1	Circular	1.75
LJ7377-2	J7377	J7368	237	0.015	840.3	836.3	Natural	1.00
LJ7377-3	J7377	J6876	439	0.015	840.3	835.3	Natural	1.00
LJ7391-1	J7391	J7363	21	0.014	831.8	831.6	Circular	6.00
LJ7391-2	J7391	J7363	21	0.015	844.1	841.0	Natural	1.00
LJ7411-1	J7411	J7416	72	0.014	910.8	910.3	Circular	1.00
LJ7411-2	J7411	J7416	72	0.015	915.3	915.3	Natural	1.00
LJ7416-1	J7416	J7445	226	0.014	910.3	904.7	Circular	1.00
LJ7416-2	J7416	J7445	226	0.015	915.3	909.3	Natural	1.00
LJ7425-1	J7425	J7464	60	0.014	858.8	858.5	Circular	2.00
LJ7425-2	J7425	J7464	60	0.015	862.8	863.3	Natural	1.00
LJ7445-1	J7445	J7566	245	0.014	904.7	897.1	Circular	1.00
LJ7445-2	J7445	J7566	245	0.015	909.3	904.3	Natural	1.00
LJ7464-1	J7464	J7565	191	0.014	858.5	857.7	Circular	2.00
LJ7464-2	J7464	J7565	191	0.015	863.3	865.3	Natural	1.00
LJ7543-1	J7543	J7175	298	0.014	852.9	844.2	Circular	1.00
LJ7543-2	J7543	J7175	298	0.015	860.8	849.5	Natural	1.00
LJ7565-1	J7565	J7570	33	0.014	857.7	857.7	Circular	2.00
LJ7565-2	J7565	J7570	33	0.015	865.3	865.3	Natural	1.00
LJ7566-1	J7566	J7643	271	0.014	897.1	887.8	Circular	1.00
LJ7566-2	J7566	J7643	271	0.015	904.3	896.3	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ7570-1	J7570	J7576	90	0.014	856.0	852.6	Circular	2.00
LJ7570-2	J7570	J7576	90	0.015	865.3	864.8	Natural	1.00
LJ7576-1	J7576	J7366	210	0.014	851.7	848.7	Circular	2.50
LJ7576-2	J7576	J7366	210	0.015	864.8	857.6	Natural	1.00
LJ7600-1	J7600	J7391	223	0.014	832.4	830.0	Special	8.17
LJ7600-2	J7600	J7391	223	0.015	866.7	844.1	Natural	1.00
LJ7609-1	J7609	J7600	15	0.014	832.6	832.4	Special	8.17
LJ7609-2	J7609	J7600	15	0.015	866.7	866.7	Natural	1.00
LJ7611-1	J7611	J7543	82	0.014	854.9	853.0	Circular	1.00
LJ7611-2	J7611	J7543	82	0.015	861.6	860.8	Natural	1.00
LJ7643-1	J7643	J7774	132	0.014	887.8	881.8	Circular	1.50
LJ7643-2	J7643	J7774	132	0.015	896.3	885.3	Natural	1.00
LJ7663-1	J7663	J7609	198	0.014	834.7	832.6	Special	8.17
LJ7663-2	J7663	J7609	198	0.015	866.7	866.7	Natural	1.00
LJ7737-1	J7737	J7735	90	0.014	871.1	868.2	Circular	2.00
LJ7737-2	J7737	J7735	90	0.015	877.3	872.9	Natural	1.00
LJ7739-1	J7739	J7611	185	0.014	0.0	0.0	Circular	2.75
LJ7739-2	J7739	J7611	0	0.015	0.0	0.0	Natural	1.00
LJ7774-1	J7774	J7778	162	0.014	880.3	873.7	Circular	2.00
LJ7774-2	J7774	J7778	162	0.015	885.3	880.3	Natural	1.00
LJ7776-1	J7776	J7781	139	0.014	893.1	888.8	Circular	2.00
LJ7776-2	J7776	J7781	139	0.015	897.3	894.8	Natural	1.00
LJ7778-1	J7778	J7737	63	0.014	873.7	871.1	Circular	2.00
LJ7778-2	J7778	J7737	63	0.015	880.3	877.3	Natural	1.00
LJ7781-1	J7781	J7774	165	0.014	886.4	880.3	Circular	2.00
LJ7781-2	J7781	J7774	165	0.015	894.8	885.3	Natural	1.00
LJ7907-1	J7946	J7735	99	0.014	868.3	865.3	Circular	1.25
LJ7907-2	J7946	J7735	99	0.015	875.3	872.9	Natural	1.00
LJ7973-1	J7973	J7946	112	0.014	870.0	868.3	Circular	1.00
LJ7973-2	J7973	J7946	112	0.015	877.3	875.3	Natural	1.00
LJ7977-1	J7977	J7739	189	0.014	0.0	0.0	Circular	2.75
LJ7977-2	J7977	J7739	0	0.015	0.0	0.0	Natural	1.00
LJ7993-1	J7993	J7973	83	0.014	870.8	870.0	Circular	1.00
LJ7993-2	J7993	J7973	83	0.015	879.3	877.3	Natural	1.00
LJ8043-1	J8043	J7663	437	0.014	834.2	834.7	Special	8.17
LJ8043-2	J8043	J7663	437	0.015	870.5	866.7	Natural	1.00
LJ8061-1	J8061	J7977	177	0.014	0.0	0.0	Circular	2.75
LJ8061-2	J8061	J7977	0	0.015	0.0	0.0	Natural	1.00
LJ8063-1	J8063	J7993	118	0.014	875.0	870.8	Circular	1.00
LJ8063-2	J8063	J7993	118	0.015	882.3	879.3	Natural	1.00
LJ8085-1	J8085	J8136	30	0.014	878.3	878.1	Circular	1.00
LJ8085-2	J8085	J8136	30	0.015	886.3	886.3	Natural	1.00
LJ8108-1	J8108	J7781	358	0.014	891.7	888.7	Circular	1.00
LJ8108-2	J8108	J7781	358	0.015	897.8	894.8	Natural	1.00
LJ8136-1	J8136	J8063	102	0.014	878.1	875.0	Circular	1.00
LJ8136-2	J8136	J8063	102	0.015	886.3	882.3	Natural	1.00
LJ8350-1	JDOT1	J8043	141	0.014	834.7	834.2	Special	8.17

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ8350-2	JDOT1	J8043	141	0.015	846.1	870.5	Natural	1.00
LJ8427-1	J8427	JDOT1	145	0.014	835.4	834.7	Special	8.17
LJ8427-2	J8427	JDOT1	145	0.015	870.5	846.1	Natural	1.00
LJ8442-1	J8442	J8427	255	0.014	835.7	835.4	Special	8.17
LJ8442-2	J8442	J8427	255	0.015	872.3	870.5	Natural	1.00
LJ8469-1	J8469	J8442	36	0.014	846.7	846.6	Circular	6.00
LJ8469-2	J8469	J8442	36	0.015	872.3	872.3	Natural	1.00
LJ8475-1	J8475	J8557	83	0.014	891.3	890.3	Circular	1.00
LJ8475-2	J8475	J8557	83	0.015	898.3	897.3	Natural	1.00
LJ8539-1	J8539	J8442	112	0.014	849.3	849.1	Circular	2.75
LJ8539-2	J8539	J8442	112	0.015	870.6	872.3	Natural	1.00
LJ8557-1	J8557	J8558	175	0.014	889.5	886.4	Circular	2.00
LJ8557-2	J8557	J8558	175	0.015	897.3	893.8	Natural	1.00
LJ8558-1	J8558	J8561	125	0.014	886.1	884.0	Circular	2.00
LJ8558-2	J8558	J8561	125	0.015	893.8	890.3	Natural	1.00
LJ8561-1	J8561	J8596	93	0.014	884.0	883.3	Circular	2.00
LJ8561-2	J8561	J8596	93	0.015	891.3	891.3	Natural	1.00
LJ8596-1	J8596	J8442	521	0.014	883.3	835.7	Circular	2.00
LJ8625-1	J8625	J8469	190	0.014	847.3	846.7	Circular	6.00
LJ8625-2	J8625	J8469	190	0.015	869.8	872.3	Natural	1.00
LJ8626-11	J8626	J8625	15	0.014	849.5	847.3	Circular	2.50
LJ8626-12	J8626	J8539	113	0.014	849.5	849.3	Circular	2.75
LJ8626-21	J8626	J8625	15	0.015	869.8	869.8	Natural	1.00
LJ8626-22	J8626	J8539	113	0.015	869.8	870.6	Natural	1.00
LJ8810-1	J8810	J8626	141	0.014	849.7	849.5	Circular	2.50
LJ8810-2	J8810	J8626	141	0.015	867.6	869.8	Natural	1.00
LJ8838-1	J8838	J8846	232	0.014	903.5	897.7	Circular	1.00
LJ8838-2	J8838	J8846	232	0.015	910.0	900.3	Natural	1.00
LJ8846-1	J8846	J8847	155	0.014	897.7	882.7	Circular	1.00
LJ8846-2	J8846	J8847	155	0.015	900.3	889.0	Natural	1.00
LJ8847-1	J8847	J8877	175	0.014	880.8	867.4	Circular	1.00
LJ8847-2	J8847	J8877	175	0.015	889.0	876.1	Natural	1.00
LJ8863-1	J8863	J8810	164	0.014	850.0	849.7	Circular	2.50
LJ8863-2	J8863	J8810	164	0.015	863.8	867.6	Natural	1.00
LJ8877-1	J8877	J8863	111	0.014	867.4	858.0	Circular	1.00
LJ8877-2	J8877	J8863	111	0.015	876.1	863.8	Natural	1.00
LJ8901-1	J8901	J8863	79	0.014	850.1	850.0	Circular	2.50
LJ8901-2	J8901	J8863	79	0.015	862.3	863.8	Natural	1.00
LJ9041-1	J9041	J8625	500	0.014	848.8	847.3	Circular	6.00
LJ9041-2	J9041	J8625	500	0.015	860.3	869.8	Natural	1.00
LJ9055-1	J9055	J8901	121	0.014	850.3	850.1	Circular	2.50
LJ9055-2	J9055	J8901	121	0.015	860.6	862.3	Natural	1.00
LJ9157-11	J9157	J9041	20	0.014	853.1	851.4	Circular	1.00
LJ9157-12	J9157	J9055	36	0.014	850.4	850.3	Circular	1.00
LJ9157-21	J9157	J9041	20	0.015	861.3	860.3	Natural	1.00
LJ9157-22	J9157	J9055	36	0.015	861.3	860.6	Natural	1.00
LJ9162-1	J9162	J9167	163	0.014	870.8	860.8	Circular	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ9162-2	J9162	J9167	163	0.015	876.3	870.3	Natural	1.00
LJ9162-3	J9162	J9941	659	0.015	876.3	858.8	Natural	1.00
LJ9167-1	J9167	J9157	138	0.014	860.8	853.1	Circular	1.00
LJ9167-2	J9167	J9157	138	0.015	870.3	861.8	Natural	1.00
LJ9174-1	J9174	J9179	183	0.014	884.7	876.4	Circular	1.00
LJ9174-2	J9174	J9179	183	0.015	890.3	882.8	Natural	1.00
LJ9179-1	J9179	J9185	148	0.014	876.4	869.5	Circular	1.00
LJ9179-2	J9179	J9185	148	0.015	882.8	875.3	Natural	1.00
LJ9184-1	J9184	J9189	148	0.014	861.7	853.7	Circular	1.00
LJ9184-2	J9184	J9189	148	0.015	868.3	864.3	Natural	1.00
LJ9185-1	J9185	J9184	156	0.014	869.5	861.7	Circular	1.00
LJ9185-2	J9185	J9184	156	0.015	875.3	868.3	Natural	1.00
LJ9188-1	J9188	J9162	163	0.014	879.3	870.8	Circular	1.00
LJ9188-2	J9188	J9162	163	0.015	882.3	876.3	Natural	1.00
LJ9189-1	J9189	J9041	58	0.014	853.7	853.2	Circular	1.00
LJ9189-2	J9189	J9041	58	0.015	864.3	860.3	Natural	1.00
LJ9190-1	J9190	J9188	171	0.014	890.2	879.3	Circular	1.00
LJ9190-2	J9190	J9188	171	0.015	894.3	882.3	Natural	1.00
LJ9245-1	J9245	J9157	20	0.014	850.3	850.3	Circular	2.25
LJ9245-2	J9245	J9157	20	0.015	860.3	860.3	Natural	1.00
LJ9373-1	J9373	J9245	181	0.014	850.6	850.3	Circular	2.25
LJ9373-2	J9373	J9245	181	0.015	859.8	860.3	Natural	1.00
LJ9419-1	J9419	J9041	330	0.014	850.1	850.3	Circular	6.00
LJ9419-2	J9419	J9041	330	0.015	859.3	860.3	Natural	1.00
LJ9461-1	J9461	J9807	313	0.014	882.8	881.3	Circular	1.00
LJ9461-2	J9461	J9807	313	0.015	888.3	888.3	Natural	1.00
LJ9537-1	J9537	J9373	210	0.014	850.9	850.6	Circular	2.25
LJ9537-2	J9537	J9373	210	0.015	859.3	859.8	Natural	1.00
LJ9794-1	J9794	J9537	221	0.014	851.2	850.9	Circular	2.25
LJ9794-2	J9794	J9537	221	0.015	858.3	859.3	Natural	1.00
LJ9797-1	J9797	J9419	335	0.014	850.0	850.1	Circular	6.00
LJ9797-2	J9797	J9419	335	0.015	857.3	859.3	Natural	1.00
LJ9802-1	J9802	J9810	323	0.014	865.6	855.8	Circular	1.75
LJ9802-2	J9802	J9810	323	0.015	870.3	860.3	Natural	1.00
LJ9807-1	J9807	J9817	409	0.014	880.3	876.9	Circular	1.50
LJ9807-2	J9807	J9817	409	0.015	887.3	883.3	Natural	1.00
LJ9809-1	J9809	J9811	24	0.014	881.0	881.0	Circular	1.50
LJ9809-2	J9809	J9811	24	0.015	887.8	887.3	Natural	1.00
LJ9810-1	J9810	J9952	30	0.014	855.8	855.3	Circular	1.75
LJ9810-2	J9810	J9952	30	0.015	860.4	860.3	Natural	1.00
LJ9811-1	J9811	J9807	420	0.014	881.0	880.3	Circular	1.50
LJ9811-2	J9811	J9807	420	0.015	887.4	887.3	Natural	1.00
LJ9817-1	J9817	J9802	339	0.014	876.9	867.2	Circular	1.75
LJ9817-2	J9817	J9802	339	0.015	883.3	870.3	Natural	1.00
LJ9817-3	J9817	J10613	675	0.015	876.9	874.8	Natural	1.00
LJ9874-11	J9874	J9797	20	0.014	850.7	850.3	Circular	3.00
LJ9874-12	J9874	J9794	12	0.014	851.3	851.2	Circular	2.25

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ9874-21	J9874	J9797	20	0.015	858.3	857.3	Natural	1.00
LJ9874-22	J9874	J9794	12	0.015	858.3	858.3	Natural	1.00
LJ9885-1	J9885	J9907	285	0.014	888.6	885.0	Circular	1.00
LJ9885-2	J9885	J9907	285	0.015	895.3	889.3	Natural	1.00
LJ9907-1	J9907	J9915	169	0.014	885.0	883.4	Circular	1.00
LJ9907-2	J9907	J9915	169	0.015	889.3	888.3	Natural	1.00
LJ9915-1	J9915	J9809	32	0.014	883.4	882.7	Circular	1.00
LJ9915-2	J9915	J9809	32	0.015	888.3	887.8	Natural	1.00
LJ9920-1	J9920	J9923	298	0.014	876.0	866.2	Circular	1.00
LJ9920-2	J9920	J9923	298	0.015	881.3	874.3	Natural	1.00
LJ9922-1	J9922	J9924	283	0.014	863.6	853.0	Circular	1.50
LJ9922-2	J9922	J9924	283	0.015	871.3	861.3	Natural	1.00
LJ9923-1	J9923	J9922	35	0.014	865.3	865.2	Circular	1.50
LJ9923-2	J9923	J9922	35	0.015	874.3	871.3	Natural	1.00
LJ9924-1	J9924	J9797	43	0.014	853.0	852.7	Circular	1.75
LJ9924-2	J9924	J9797	43	0.015	861.3	857.3	Natural	1.00
LJ9942-1	J9942	J9949	149	0.014	853.0	852.6	Circular	3.00
LJ9942-2	J9942	J9949	149	0.015	859.4	859.3	Natural	1.00
LJ9949-1	J9949	J9941	11	0.014	852.6	852.6	Circular	3.00
LJ9949-2	J9949	J9941	11	0.015	859.3	858.8	Natural	1.00
LJ9952-1	J9952	J9942	157	0.014	853.4	853.0	Circular	3.00
LJ9952-2	J9952	J9942	157	0.015	860.3	859.3	Natural	1.00
LJ9986-1	J9986	J9874	28	0.014	851.3	851.3	Circular	2.25
LJ9986-2	J9986	J9874	28	0.015	858.4	858.3	Natural	1.00
LJDOT1-2	JDOT1	JDOT3	1460	0.015	846.1	818.7	Rectangula	10.00
LJDOT4-3	JDOT4	J7009	33	0.015	825.3	824.8	Natural	1.00
LJUNCT	JUNCT	DS6	2985	0.014	734.5	731.5	Circular	14.00
LL14613-1	L14613	L14897	340	0.014	861.1	859.6	Circular	1.00
LL14613-2	L14613	L14897	340	0.015	866.3	865.8	Natural	1.00
LL14670-1	L14670	L14731	145	0.014	861.9	861.1	Circular	0.75
LL14670-2	L14670	L14731	145	0.015	864.6	865.4	Natural	1.00
LL14678-1	L14678	L14732	122	0.014	862.5	861.6	Circular	0.75
LL14678-2	L14678	L14732	122	0.015	865.1	865.8	Natural	1.00
LL14731-1	L14731	L14975	138	0.014	861.1	860.3	Circular	0.75
LL14731-2	L14731	L14975	138	0.015	865.4	865.6	Natural	1.00
LL14732-1	L14732	L14992	142	0.014	861.6	860.5	Circular	0.75
LL14732-2	L14732	L14992	142	0.015	865.8	866.6	Natural	1.00
LL14897-1	L14897	L14984	31	0.014	859.6	859.5	Circular	1.00
LL14897-2	L14897	L14984	31	0.015	865.8	865.8	Natural	1.00
LL14973-1	L14973	L14975	147	0.014	858.7	858.3	Circular	1.50
LL14973-2	L14973	L14975	147	0.015	865.8	865.6	Natural	1.00
LL14975-1	L14975	L15000	154	0.014	858.3	857.8	Circular	1.50
LL14975-2	L14975	L15000	154	0.015	865.6	865.3	Natural	1.00
LL14984-1	L14984	L14973	33	0.014	858.8	858.7	Circular	1.50
LL14984-2	L14984	L14973	33	0.015	865.8	865.8	Natural	1.00
LL14988-1	L15010	L14989	296	0.014	855.6	855.5	Circular	3.50
LL14988-2	L15010	L14989	296	0.015	862.8	863.3	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LL14989-1	L14989	L15020	54	0.014	855.5	855.3	Circular	3.50
LL14989-2	L14989	L15020	54	0.015	863.3	863.3	Natural	1.00
LL14992-1	L14992	L14984	129	0.014	860.5	858.8	Circular	0.75
LL14992-2	L14992	L14984	129	0.015	866.6	865.8	Natural	1.00
LL15000-1	L15000	L15005	321	0.014	857.8	856.8	Circular	2.25
LL15000-2	L15000	L15005	321	0.015	865.3	862.3	Natural	1.00
LL15004-1	L15004	L15011	284	0.014	856.7	856.2	Circular	3.00
LL15004-2	L15004	L15011	284	0.015	862.3	862.8	Natural	1.00
LL15005-1	L15005	L15004	34	0.014	856.8	856.7	Circular	3.00
LL15005-2	L15005	L15004	34	0.015	862.3	862.3	Natural	1.00
LL15005-3	L15005	Lake-Clin	586	0.015	862.3	861.3	Natural	0.50
LL15011-1	L15011	L15012	9	0.014	856.2	855.7	Circular	3.00
LL15011-2	L15011	L15012	9	0.015	862.8	862.8	Natural	1.00
LL15012-1	L15012	L15010	39	0.014	855.7	855.6	Circular	3.50
LL15012-2	L15012	L15010	39	0.015	862.8	862.8	Natural	1.00
LL15020-1	L15020	DS3(31ST)	86	0.014	855.3	854.5	Circular	5.00
LL15020-2	L15020	DS3(31ST)	86	0.015	863.3	864.5	Natural	1.00
LL15327-1	L15327	L15020	262	0.014	858.1	856.3	Circular	3.50
LL15327-2	L15327	L15020	262	0.015	865.1	863.3	Natural	1.00
LL15410-1	L15533	L15327	334	0.014	860.3	858.1	Circular	3.50
LL15410-2	L15533	L15327	334	0.015	868.8	865.1	Natural	1.00
LL15417-1	L15417	L15484	46	0.014	865.9	865.7	Circular	1.25
LL15417-2	L15417	L15484	46	0.015	869.7	870.2	Natural	1.00
LL15484-1	L15484	L15868	133	0.014	865.7	865.1	Circular	1.25
LL15484-2	L15484	L15868	133	0.015	870.2	870.3	Natural	1.00
LL15576-1	L15576	L15581	59	0.014	863.4	863.2	Circular	1.50
LL15576-2	L15576	L15581	59	0.015	868.3	868.3	Natural	1.00
LL15576-3	L15576	L15005	607	0.015	868.3	862.3	Natural	1.00
LL15577-1	L15577	L15578	58	0.014	864.3	864.1	Circular	1.50
LL15577-2	L15577	L15578	58	0.015	869.3	869.3	Natural	1.00
LL15577-3	L15577	L15000	609	0.015	869.3	865.3	Natural	1.00
LL15578-1	L15578	L15576	281	0.014	864.1	863.4	Circular	1.50
LL15578-2	L15578	L15576	281	0.015	869.3	868.3	Natural	1.00
LL15581-1	L15581	L15591	258	0.014	862.9	863.1	Circular	2.50
LL15581-2	L15581	L15591	258	0.015	868.3	870.8	Natural	1.00
LL15583-1	L15583	L15587	278	0.014	862.7	861.5	Circular	2.50
LL15583-2	L15583	L15587	278	0.015	871.3	868.8	Natural	1.00
LL15587-1	L15587	L15533	18	0.014	861.4	861.4	Circular	2.50
LL15587-2	L15587	L15533	18	0.015	868.8	868.8	Natural	1.00
LL15588-1	L15588	L15583	39	0.014	862.8	862.7	Circular	2.50
LL15588-2	L15588	L15583	39	0.015	871.3	871.3	Natural	1.00
LL15588-3	L15588	L15012	611	0.015	871.3	862.8	Natural	1.00
LL15591-1	L15591	L15588	27	0.014	863.1	862.8	Circular	2.50
LL15591-2	L15591	L15588	27	0.015	870.8	871.3	Natural	1.00
LL15593-1	L15593	L15605	44	0.014	861.9	861.2	Special	3.65
LL15593-2	L15593	L15605	44	0.015	868.3	867.8	Natural	1.00
LL15594-1	L15594	L15593	267	0.014	862.2	861.9	Circular	2.75

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LL15594-2	L15594	L15593	267	0.015	868.3	868.3	Natural	1.00
LL15595-1	L15596	L15594	51	0.014	862.2	862.2	Circular	2.75
LL15595-2	L15596	L15594	51	0.015	868.3	868.3	Natural	1.00
LL15596-3	L15596	M15027	610	0.015	868.3	865.3	Natural	1.00
LL15598-1	L15598	L15596	132	0.014	862.3	862.2	Circular	2.75
LL15598-2	L15598	L15596	132	0.015	869.3	868.3	Natural	1.00
LL15600-1	L15600	L15598	171	0.014	862.6	862.3	Circular	2.75
LL15600-2	L15600	L15598	171	0.015	870.3	869.3	Natural	1.00
LL15614-1	L15605	L15533	303	0.014	861.2	860.3	Circular	3.50
LL15614-2	L15605	L15533	303	0.015	867.8	868.8	Natural	1.00
LL15653-1	L15653	L15581	48	0.014	863.4	862.9	Special	1.13
LL15653-2	L15653	L15581	48	0.015	868.3	868.3	Natural	1.00
LL15854-1	L15854	L15600	91	0.014	862.7	862.6	Circular	2.75
LL15854-2	L15854	L15600	91	0.015	870.3	870.3	Natural	1.00
LL15857-1	L15857	L15854	180	0.014	862.6	862.7	Circular	2.75
LL15857-2	L15857	L15854	180	0.015	869.8	870.3	Natural	1.00
LL15859-1	L15860	L15857	212	0.014	863.3	862.6	Circular	2.75
LL15859-2	L15860	L15857	212	0.015	869.1	869.8	Natural	1.00
LL15861-1	L15861	L15862	24	0.014	863.6	863.6	Circular	2.00
LL15861-2	L15861	L15862	24	0.015	869.6	869.3	Natural	1.00
LL15862-1	L15862	L15860	56	0.014	863.6	863.3	Circular	2.75
LL15862-2	L15862	L15860	56	0.015	869.3	869.1	Natural	1.00
LL15862-3	L15860	M15119	677	0.015	869.1	868.3	Natural	1.00
LL15867-1	L15867	L15868	212	0.014	864.9	863.8	Circular	2.00
LL15867-2	L15867	L15868	212	0.015	871.3	870.3	Natural	1.00
LL15868-1	L15868	L15861	155	0.014	863.8	863.6	Circular	2.00
LL15868-2	L15868	L15861	155	0.015	870.3	869.6	Natural	1.00
LL15870-1	L15870	L15867	35	0.014	865.8	865.6	Circular	1.50
LL15870-2	L15870	L15867	35	0.015	871.3	871.3	Natural	1.00
LL15870-3	L15870	M15102	681	0.015	871.3	869.3	Natural	1.00
LL16039-1	L16039	L15598	186	0.014	866.4	864.3	Circular	0.75
LL16039-2	L16039	L15598	186	0.015	872.3	869.3	Natural	1.00
LL16086-1	L16086	L16039	149	0.014	868.1	866.4	Circular	0.75
LL16086-2	L16086	L16039	149	0.015	871.2	872.3	Natural	1.00
LL16092-1	L16092	L15653	316	0.014	863.9	863.4	Circular	1.50
LL16092-2	L16092	L15653	316	0.015	868.8	868.3	Natural	1.00
LL16228-1	L16228	L16092	285	0.014	864.2	863.9	Circular	1.50
LL16228-2	L16228	L16092	285	0.015	869.3	868.8	Natural	1.00
LL16228-3	L16228	N16989	680	0.015	869.3	865.3	Natural	1.00
LL16313-1	L16313	L16228	36	0.014	864.6	864.2	Circular	1.00
LL16313-2	L16313	L16228	36	0.015	869.3	869.3	Natural	1.00
LL16318-1	L16318	L16313	268	0.014	865.4	864.6	Circular	1.00
LL16318-2	L16318	L16313	268	0.015	872.3	869.3	Natural	1.00
LLORINGPK	LORINGPK	DS12	1200	0.014	743.5	742.3	Circular	9.00
LM13902-1	M13902	M14298	412	0.014	866.9	866.1	Circular	1.25
LM13902-2	M13902	M14298	412	0.015	873.7	872.1	Natural	1.00
LM13907-1.	M13907	M14065	237	0.014	865.1	864.1	Circular	2.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LM13907-2.	M13907	M14065	237	0.015	872.3	871.3	Natural	1.00
LM14065-1.	M14065	M14081	51	0.014	864.1	863.9	Circular	2.00
LM14065-2.	M14065	M14081	51	0.015	871.3	871.1	Natural	1.00
LM14081-1.	M14081	M14234	97	0.014	863.9	863.5	Circular	2.00
LM14081-2.	M14081	M14234	97	0.015	871.1	870.8	Natural	1.00
LM14234-1.	M14234	M14368-1	54	0.014	863.3	862.7	Circular	2.00
LM14234-2.	M14234	M14368-1	54	0.015	870.8	870.3	Natural	1.00
LM14296-2	M14298	MH187	212	0.015	872.1	871.6	Natural	1.00
LM14347-3.	M14298	M15102	632	0.015	872.1	869.3	Natural	1.00
LM14368-1	M14368-1	M14372	165	0.014	862.7	862.3	Circular	2.75
LM14368-2	M14368-1	M14372	165	0.015	870.3	869.8	Natural	1.00
LM14368-3	M14368-1	M15119	625	0.015	870.3	868.3	Natural	1.00
LM14370-1	M14370	M14373	49	0.014	861.7	861.6	Circular	3.00
LM14370-2	M14370	M14373	49	0.015	869.2	869.1	Natural	1.00
LM14370-3	M14370	M15041	613	0.015	869.2	867.3	Natural	1.00
LM14371-1	M14371	M14520	50	0.014	861.0	860.7	Circular	3.00
LM14371-2	M14371	M14520	50	0.015	868.3	868.2	Natural	1.00
LM14372-1	M14372	M14374	211	0.014	862.3	861.8	Circular	2.75
LM14372-2	M14372	M14374	211	0.015	869.8	869.3	Natural	1.00
LM14373-1	M14373	M14371	253	0.014	861.6	861.0	Circular	3.00
LM14373-2	M14373	M14371	253	0.015	869.1	868.3	Natural	1.00
LM14374-1	M14374	M14370	25	0.014	861.8	861.7	Circular	2.75
LM14374-2	M14374	M14370	25	0.015	869.3	869.2	Natural	1.00
LM14520-1	M14520	M14656	264	0.014	860.7	859.5	Circular	3.00
LM14520-2	M14520	M14656	264	0.015	868.3	866.8	Natural	1.00
LM14578-1	M14578	MH187	136	0.014	865.4	865.0	Circular	1.25
LM14578-2	M14578	MH187	136	0.015	870.3	871.6	Natural	1.00
LM14656-1	M14656	M14899	272	0.014	859.5	858.2	Circular	3.00
LM14656-2	M14656	M14899	272	0.015	866.8	865.3	Natural	1.00
LM14695-1	M14695	M15026	270	0.014	857.4	856.0	Circular	1.00
LM14695-2	M14695	M15026	0	0.015	0.0	0.0	Natural	1.00
LM14714-1	M14714	M14877	165	0.014	859.1	858.3	Circular	1.25
LM14714-2	M14714	M14877	0	0.015	0.0	0.0	Natural	1.00
LM14877-1	M14877	M15041	60	0.014	858.3	858.0	Circular	1.25
LM14877-2	M14877	M15041	0	0.015	0.0	0.0	Natural	1.00
LM14899-1	M14899	M15027	36	0.014	858.2	857.9	Circular	3.00
LM14899-2	M14899	M15027	36	0.015	865.3	865.2	Natural	1.00
LM15022-1	M15022	DS3(31ST)	211	0.014	851.5	850.2	Circular	4.00
LM15022-2	M15022	DS3(31ST)	211	0.015	863.8	864.5	Natural	1.00
LM15024-1	M15024	M15022	48	0.014	851.7	851.5	Circular	3.50
LM15024-2	M15024	M15022	48	0.015	863.9	863.8	Natural	1.00
LM15026-1	M15026	M15024	260	0.014	853.1	851.7	Circular	3.50
LM15026-2	M15026	M15024	260	0.015	865.3	863.8	Natural	1.00
LM15027-1	M15027	M15026	24	0.014	853.6	853.1	Circular	3.50
LM15027-2	M15027	M15026	24	0.015	865.4	865.3	Natural	1.00
LM15041-1	M15041	M15027	302	0.014	855.4	853.6	Circular	3.00
LM15041-2	M15041	M15027	302	0.015	867.3	865.3	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LM15102-1	M15102	M15104	97	0.014	863.8	863.4	Circular	1.75
LM15102-2	M15102	M15104	97	0.015	869.3	869.1	Natural	1.00
LM15104-1	M15104	M15107	96	0.014	863.4	862.9	Circular	1.75
LM15104-2	M15104	M15107	96	0.015	869.1	868.8	Natural	1.00
LM15107-1	M15107	M15108	28	0.014	862.9	862.8	Circular	2.25
LM15107-2	M15107	M15108	28	0.015	868.8	868.7	Natural	1.00
LM15108-1	M15108	M15112	134	0.014	862.8	862.3	Circular	2.25
LM15108-2	M15108	M15112	134	0.015	868.7	868.6	Natural	1.00
LM15112-1	M15112	M15115	48	0.014	862.3	862.0	Circular	2.25
LM15112-2	M15112	M15115	48	0.015	868.6	868.4	Natural	1.00
LM15115-1	M15115	M15119	40	0.014	862.0	861.9	Circular	2.75
LM15115-2	M15115	M15119	40	0.015	868.4	868.3	Natural	1.00
LM15119-1	M15119	M15123	188	0.014	861.9	861.2	Circular	2.75
LM15119-2	M15119	M15123	188	0.015	868.3	867.8	Natural	1.00
LM15123-1	M15123	M15131	225	0.014	861.2	860.3	Circular	2.75
LM15123-2	M15123	M15131	225	0.015	867.8	867.3	Natural	1.00
LM15131-1	M15131	M15041	57	0.014	855.7	855.4	Circular	3.00
LM15131-2	M15131	M15041	57	0.015	867.3	867.3	Natural	1.00
LMH148-2	V14500-1	MH155A	234	0.015	874.9	874.3	Natural	1.00
LN16989-1	N16989	N16993	34	0.014	862.2	862.1	Circular	1.50
LN16989-2	N16989	N16993	34	0.015	865.3	865.3	Natural	1.00
LN16993-1	N16993	N16996	90	0.014	862.1	861.9	Circular	2.00
LN16993-2	N16993	N16996	90	0.015	865.3	866.3	Natural	1.00
LN16996-1	N16996	N17001	246	0.014	861.9	861.6	Circular	2.00
LN16996-2	N16996	N17001	246	0.015	866.3	868.3	Natural	1.00
LN17001-1	N17001	N17014	162	0.014	861.6	860.9	Circular	2.00
LN17001-2	N17001	N17014	162	0.015	868.3	868.1	Natural	1.00
LN17001-3	N17001	O17675	661	0.015	868.3	858.3	Natural	1.00
LN17014-1	N17014	N17019	131	0.014	860.9	860.3	Circular	2.00
LN17014-2	N17014	N17019	131	0.015	868.1	867.8	Natural	1.00
LN17019	N17019	235-0	184	0.014	858.3	846.0	Circular	2.50
LO17382-1	O17382	DS2(35th)	87	0.014	829.6	829.3	Circular	5.50
LO17382-2	O17382	DS2(35th)	87	0.015	850.6	839.6	Natural	1.00
LO17590-1	O17590	O17595	59	0.014	855.9	854.2	Circular	1.50
LO17590-2	O17590	O17595	59	0.015	860.1	859.8	Natural	1.00
LO17593-1	O17593	O17590	306	0.014	857.3	855.9	Circular	1.00
LO17593-2	O17593	O17590	306	0.015	864.7	860.1	Natural	1.00
LO17595-1	O17595	O17606	148	0.014	853.7	853.0	Circular	1.50
LO17595-2	O17595	O17606	148	0.015	859.8	858.8	Natural	1.00
LO17606-1	O17606	O17608	148	0.014	853.0	852.3	Circular	1.50
LO17606-2	O17606	O17608	148	0.015	858.8	858.3	Natural	1.00
LO17608-1	O17608	O17620	171	0.014	852.3	851.4	Circular	2.00
LO17608-2	O17608	O17620	171	0.015	858.3	857.1	Natural	1.00
LO17608-3	O17608	O18178	649	0.015	858.3	851.8	Natural	1.00
LO17620-1	O17620	O17636	115	0.014	851.4	850.7	Circular	2.00
LO17620-2	O17620	O17636	115	0.015	857.1	856.8	Natural	1.00
LO17636-1	O17636	O17854	75	0.014	850.7	850.3	Circular	2.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LO17636-2	O17636	O17854	75	0.015	856.8	856.1	Natural	1.00
LO17675-1	O17675	O17676	14	0.014	851.8	851.7	Circular	1.25
LO17675-2	O17675	O17676	14	0.015	858.3	858.3	Natural	1.00
LO17675-3	O17675	O18191	640	0.015	858.3	855.3	Natural	1.00
LO17676-1	O17676	O17678	165	0.014	851.7	850.7	Circular	1.25
LO17676-2	O17676	O17678	165	0.015	858.3	857.3	Natural	1.00
LO17678-1	O17678	O17695	189	0.014	850.7	849.5	Circular	1.25
LO17678-2	O17678	O17695	189	0.015	857.3	856.3	Natural	1.00
LO17695-1	O17695	O17382	85	0.014	838.6	838.3	Circular	5.50
LO17695-2	O17695	O17382	85	0.015	856.3	850.6	Natural	1.00
LO17930-1	O17854	O17980	289	0.014	850.1	848.3	Circular	2.50
LO17930-2	O17854	O17980	289	0.015	856.1	854.3	Natural	1.00
LO17976-1	O17976	O17695	254	0.014	839.2	838.6	Circular	5.50
LO17976-2	O17976	O17695	254	0.015	856.0	856.3	Natural	1.00
LO17980-1	O17980	O18192	319	0.014	848.3	844.5	Circular	2.50
LO17980-2	O17980	O18192	319	0.015	854.3	852.3	Natural	1.00
LO17993-1	O17993	O18007	163	0.014	850.5	849.5	Circular	0.75
LO17993-2	O17993	O18007	163	0.015	854.2	854.0	Natural	1.00
LO18000-1	O18000	O18193	196	0.014	846.3	845.3	Circular	0.75
LO18000-2	O18000	O18193	196	0.015	0.0	851.3	Natural	1.00
LO18017-1	O18007	O18370	105	0.014	849.5	848.5	Circular	0.75
LO18017-2	O18007	O18370	105	0.015	854.0	855.8	Natural	1.00
LO18063-1	O18197	O17976	402	0.014	840.3	839.2	Circular	5.50
LO18063-2	O18197	O17976	402	0.015	855.3	856.0	Natural	1.00
LO18169-1	O18169	O18170	59	0.014	849.6	849.3	Circular	1.25
LO18169-2	O18169	O18170	59	0.015	856.7	855.8	Natural	1.00
LO18170-1	O18170	O18175	134	0.014	849.3	847.5	Circular	1.25
LO18170-2	O18170	O18175	134	0.015	855.8	853.8	Natural	1.00
LO18174-1	O18174	O18186	135	0.014	842.6	841.7	Circular	5.00
LO18174-2	O18174	O18186	135	0.015	849.3	852.3	Natural	1.00
LO18175-1	O18175	O18178	132	0.014	847.5	845.8	Circular	1.25
LO18175-2	O18175	O18178	132	0.015	853.8	851.8	Natural	1.00
LO18178-1	O18178	O18184	35	0.014	845.8	845.3	Circular	1.25
LO18178-2	O18178	O18184	35	0.015	851.8	851.7	Natural	1.00
LO18181-1	O18181	O18197	150	0.014	840.8	840.3	Circular	5.00
LO18181-2	O18181	O18197	150	0.015	854.8	855.3	Natural	1.00
LO18184-1	O18184	O18187	160	0.014	845.3	844.7	Circular	3.00
LO18184-2	O18184	O18187	160	0.015	851.7	851.6	Natural	1.00
LO18186-1	O18186	O18191	180	0.014	841.7	841.3	Circular	5.00
LO18186-2	O18186	O18191	28	0.015	852.3	855.3	Natural	1.00
LO18187-1	O18187	O18192	188	0.014	844.7	843.9	Circular	3.00
LO18187-2	O18187	O18192	188	0.015	851.6	851.5	Natural	1.00
LO18191-1	O18191	O18181	168	0.014	841.3	840.8	Circular	5.00
LO18191-2	O18191	O18181	168	0.015	855.3	854.8	Natural	1.00
LO18192-1	O18192	O18193	136	0.014	843.9	843.3	Circular	3.50
LO18192-2	O18192	O18193	136	0.015	851.5	851.3	Natural	1.00
LO18193-1	O18193	O18174	199	0.014	843.4	842.6	Circular	3.50

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LO18193-2	O18193	O18174	199	0.015	851.3	849.3	Natural	1.00
LO18346-1	O18346	O18186	24	0.014	844.2	844.4	Circular	1.00
LO18346-2	O18346	O18186	24	0.015	853.9	852.3	Natural	1.00
LO18370-1	O18370	O18181	32	0.014	847.0	846.6	Circular	1.00
LO18370-2	O18370	O18181	32	0.015	855.8	854.8	Natural	1.00
LO18525-1	O18525	O18174	82	0.014	842.2	842.6	Circular	2.75
LO18525-2	O18525	O18174	82	0.015	850.3	849.3	Natural	1.00
LO18600-1	O18600	O18346	131	0.014	845.3	844.3	Circular	0.75
LO18600-2	O18600	O18346	131	0.015	850.0	853.9	Natural	1.00
LO18601-1	O18601	O18370	131	0.014	851.1	850.6	Circular	0.75
LO18601-2	O18601	O18370	131	0.015	857.3	855.8	Natural	1.00
LO18618-1	O18618	O18601	124	0.014	851.6	851.1	Circular	0.75
LO18618-2	O18618	O18601	124	0.015	855.2	857.3	Natural	1.00
LO18634-1	O18634	O18525	267	0.014	844.3	842.8	Circular	2.75
LO18634-2	O18634	O18525	267	0.015	852.7	850.3	Natural	1.00
LO18777-1	O18777	O18634	322	0.014	847.2	845.3	Circular	2.75
LO18777-2	O18777	O18634	322	0.015	855.0	852.7	Natural	1.00
LO18890-1	O18890	O18777	27	0.014	847.6	847.2	Circular	2.25
LO18890-2	O18890	O18777	27	0.015	855.5	855.0	Natural	1.00
LO18891-1	O18891	O18890	140	0.014	848.3	848.0	Circular	2.25
LO18891-2	O18891	O18890	140	0.015	856.8	855.5	Natural	1.00
LO18894-1	O18894	O18891	121	0.014	848.7	848.3	Circular	2.25
LO18894-2	O18894	O18891	121	0.015	856.3	856.8	Natural	1.00
LO18901-1	O18901	O18907	37	0.014	851.6	850.4	Circular	1.50
LO18901-2	O18901	O18907	37	0.015	856.5	856.3	Natural	1.00
LO18902-1	O18902	O18777	29	0.014	848.6	848.1	Circular	1.50
LO18902-2	O18902	O18777	29	0.015	855.3	855.0	Natural	1.00
LO18907-1	O18907	O18910	163	0.014	850.4	849.9	Circular	1.50
LO18907-2	O18907	O18910	163	0.015	856.3	856.6	Natural	1.00
LO18907-3	O18907	O18178	675	0.015	856.3	851.8	Natural	1.00
LO18910-1	O18910	O18929	108	0.014	849.9	849.6	Circular	1.50
LO18910-2	O18910	O18929	108	0.015	856.6	856.7	Natural	1.00
LO18926-1	O18926	O18902	146	0.014	850.2	848.6	Circular	1.50
LO18926-2	O18926	O18902	146	0.015	857.3	855.3	Natural	1.00
LO18928-1	O18928	O18894	51	0.014	849.2	848.7	Circular	2.25
LO18928-2	O18928	O18894	51	0.015	856.7	856.3	Natural	1.00
LO18928-3	O18928	O18192	676	0.015	856.7	852.3	Natural	1.00
LO18929-1	O18929	O18928	41	0.014	849.6	849.2	Circular	2.00
LO18929-2	O18929	O18928	41	0.015	856.7	856.7	Natural	1.00
LO18930-1	O18930	O18932	41	0.014	852.6	851.6	Circular	1.50
LO18930-2	O18930	O18932	41	0.015	859.5	859.5	Natural	1.00
LO18930-3	O18930	O18191	675	0.015	859.5	855.3	Natural	1.00
LO18932-1	O18932	O18926	152	0.014	851.6	850.2	Circular	1.50
LO18932-2	O18932	O18926	152	0.015	859.5	857.3	Natural	1.00
LO18936-1	O18936	O18930	141	0.014	853.8	852.6	Circular	1.00
LO18936-2	O18936	O18930	141	0.015	859.4	859.5	Natural	1.00
LO18941-1	O18941	O18936	152	0.014	854.5	853.8	Circular	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LO18941-2	O18941	O18936	152	0.015	861.0	859.4	Natural	1.00
LO19015-1	O19015	O18907	28	0.014	850.4	850.4	Circular	1.50
LO19015-2	O19015	O18907	28	0.015	856.3	856.3	Natural	1.00
LO19212-1	O19212	O18936	130	0.014	855.8	854.2	Circular	0.75
LO19212-2	O19212	O18936	130	0.015	859.6	859.4	Natural	1.00
LO19213-1	O19213	O18891	149	0.014	851.3	850.3	Circular	0.75
LO19213-2	O19213	O18891	149	0.015	855.7	856.8	Natural	1.00
LO19213-3	O19213	O18777	233	0.015	855.7	855.0	Natural	0.50
LO19272-1	O19272	O19015	371	0.014	850.9	850.4	Circular	1.50
LO19272-2	O19272	O19015	371	0.015	856.7	856.3	Natural	1.00
LO19355-1	O19355	O19272	227	0.014	851.7	850.9	Circular	1.50
LO19355-2	O19355	O19272	227	0.015	857.4	856.7	Natural	1.00
LO19440-1	O19440	O19446	292	0.014	854.5	852.5	Circular	1.00
LO19440-2	O19440	O19446	292	0.015	858.6	857.4	Natural	1.00
LO19446-1	O19446	O19355	29	0.014	852.5	852.3	Circular	1.25
LO19446-2	O19446	O19355	29	0.015	857.4	857.4	Natural	1.00
LO19452-1	O19452	O19355	35	0.014	851.8	851.7	Circular	1.25
LO19452-2	O19452	O19355	35	0.015	857.1	857.4	Natural	1.00
LO19455-1	O19455	O19452	328	0.014	854.0	852.0	Circular	1.00
LO19455-2	O19455	O19452	328	0.015	858.9	857.1	Natural	1.00
LP16324-1	P16324	P16327	301	0.014	865.3	864.1	Circular	1.00
LP16324-2	P16324	P16327	301	0.015	870.8	869.8	Natural	1.00
LP16324-3	P16324	P17026	655	0.015	870.8	865.8	Natural	1.00
LP16327-1	P16327	P16380	47	0.014	863.8	862.2	Circular	1.00
LP16327-2	P16327	P16380	47	0.015	869.8	869.6	Natural	1.00
LP16380-1	P16380	P16672	94	0.014	862.0	861.8	Circular	1.50
LP16380-2	P16380	P16672	94	0.015	869.6	868.6	Natural	1.00
LP16518-1	P16518	P16672	64	0.014	863.9	862.4	Circular	1.50
LP16518-2	P16518	P16672	64	0.015	869.1	868.6	Natural	1.00
LP16521-1	P16521	P16533	269	0.014	867.8	865.9	Circular	1.00
LP16521-2	P16521	P16533	269	0.015	873.3	871.3	Natural	1.00
LP16521-3	P16521	P17051	583	0.015	873.3	867.5	Natural	1.00
LP16533-1	P16533	P16518	180	0.014	865.2	864.1	Circular	1.00
LP16533-2	P16533	P16518	180	0.015	871.3	869.1	Natural	1.00
LP16672-1	P16672	P17211	570	0.014	860.7	854.0	Circular	1.75
LP16672-2	P16672	P17211	570	0.015	868.6	860.5	Natural	1.00
LP16727-1	P16727	P17046	227	0.014	859.6	858.1	Circular	0.75
LP16727-2	P16727	P17046	227	0.015	863.4	866.0	Natural	1.00
LP17018-1	P17018	P17024	332	0.014	864.0	860.6	Circular	1.00
LP17018-2	P17018	P17024	332	0.015	868.2	866.0	Natural	1.00
LP17024-1	P17024	P17026	25	0.014	860.7	860.5	Circular	1.00
LP17024-2	P17024	P17026	25	0.015	866.0	865.8	Natural	1.00
LP17026-1	P17026	P17032	277	0.014	860.5	854.4	Circular	1.25
LP17026-2	P17026	P17032	277	0.015	865.8	860.4	Natural	1.00
LP17026-3	P17026	P17699	662	0.015	865.8	858.3	Natural	1.00
LP17032-1	P17032	P17211	53	0.014	854.3	854.1	Circular	1.50
LP17032-2	P17032	P17211	53	0.015	860.4	860.5	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LP17041-1	P17041	P17211	68	0.014	854.6	854.1	Circular	1.50
LP17041-2	P17041	P17211	68	0.015	860.5	860.5	Natural	1.00
LP17046-1	P17046	P17041	184	0.014	857.1	854.8	Circular	1.25
LP17046-2	P17046	P17041	184	0.015	866.0	860.5	Natural	1.00
LP17051-1	P17051	P17046	217	0.014	860.9	858.2	Circular	1.00
LP17051-2	P17051	P17046	217	0.015	867.5	866.0	Natural	1.00
LP17051-3	P17051	P17735	662	0.015	867.5	860.3	Natural	1.00
LP17061-1	P17061	P17190	28	0.014	857.8	857.7	Circular	2.00
LP17061-2	P17061	P17190	28	0.015	864.4	864.3	Natural	1.00
LP17190-1	P17190	P17309	301	0.014	857.2	855.8	Circular	2.00
LP17190-2	P17190	P17309	301	0.015	864.3	861.8	Natural	1.00
LP17211-1	P17211	P17719	626	0.014	851.5	850.0	Circular	3.50
LP17211-2	P17211	P17719	626	0.015	860.5	859.3	Natural	1.00
LP17272-1	P17272	P17046	175	0.014	858.6	857.4	Circular	0.75
LP17272-2	P17272	P17046	175	0.015	861.5	866.0	Natural	1.00
LP17309-1	P17309	P17755	350	0.014	855.8	854.3	Circular	2.00
LP17309-2	P17309	P17755	350	0.015	861.8	861.3	Natural	1.00
LP17357-1	P17357	P17432	120	0.014	858.6	857.9	Circular	0.75
LP17357-2	P17357	P17432	120	0.015	862.6	864.3	Natural	1.00
LP17432-1	P17432	P17813	66	0.014	857.9	857.6	Circular	0.75
LP17432-2	P17432	P17813	66	0.015	864.3	866.0	Natural	1.00
LP17536-1	P17536	DS2(35th)	178	0.014	829.5	829.1	Circular	6.00
LP17536-2	P17536	DS2(35th)	178	0.015	857.3	839.6	Natural	1.00
LP17587-1	P17587	P17536	9	0.014	848.0	847.9	Circular	6.00
LP17587-2	P17587	P17536	9	0.015	857.3	857.3	Natural	1.00
LP17682-1	P17682	P17587	32	0.014	848.0	848.0	Circular	6.00
LP17682-2	P17682	P17587	32	0.015	857.4	857.3	Natural	1.00
LP17696-1	P17696	P17682	19	0.014	848.1	848.0	Circular	6.00
LP17696-2	P17696	P17682	19	0.015	857.3	857.4	Natural	1.00
LP17699-1	P17699	P17702	53	0.014	849.5	849.3	Circular	5.50
LP17699-2	P17699	P17702	53	0.015	858.3	858.3	Natural	1.50
LP17702-1	P17702	P17696	269	0.014	849.3	848.1	Circular	6.00
LP17702-2	P17702	P17696	269	0.015	858.3	857.3	Natural	1.00
LP17718-1	P17718	P17719	72	0.014	850.5	850.2	Special	3.75
LP17718-2	P17718	P17719	72	0.015	859.4	859.3	Natural	1.00
LP17719-1	P17719	P17699	271	0.014	850.2	849.5	Circular	5.50
LP17719-2	P17719	P17699	271	0.015	859.3	858.3	Natural	1.50
LP17720-1	P17720	P17718	200	0.014	851.1	850.5	Special	3.75
LP17720-2	P17720	P17718	200	0.015	859.8	859.3	Natural	1.00
LP17730-1	P17735	P17720	222	0.014	851.8	851.1	Special	3.75
LP17730-2	P17735	P17720	222	0.015	860.3	859.8	Natural	1.00
LP17736-1	P17736	P17735	35	0.014	851.9	851.8	Special	3.33
LP17736-2	P17736	P17735	35	0.015	860.4	860.3	Natural	1.00
LP17745-1	P17745	P17736	193	0.014	852.6	851.9	Special	3.33
LP17745-2	P17745	P17736	193	0.015	860.8	860.3	Natural	1.00
LP17754-1	P17754	P17772	286	0.014	866.3	864.7	Circular	1.25
LP17754-2	P17754	P17772	286	0.015	871.7	870.3	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LP17754-3	P17754	P18411	661	0.015	871.7	865.3	Natural	1.00
LP17755-1	P17755	P17745	181	0.014	853.3	852.6	Special	3.33
LP17755-2	P17755	P17745	181	0.015	861.3	860.8	Natural	1.00
LP17772-1	P17772	P17914	41	0.014	864.1	863.9	Circular	1.75
LP17772-2	P17772	P17914	41	0.015	870.3	870.0	Natural	1.00
LP17801-1	P17801	P17755	61	0.014	854.8	854.5	Circular	1.50
LP17801-2	P17801	P17755	61	0.015	862.1	861.3	Natural	1.00
LP17806-1	P17806	P17801	62	0.014	856.3	854.8	Circular	0.75
LP17806-2	P17806	P17801	62	0.015	863.7	862.1	Natural	1.00
LP17813-1	P17813	P17806	120	0.014	857.6	856.3	Circular	0.75
LP17813-2	P17813	P17806	120	0.015	866.0	863.7	Natural	1.00
LP17912-1	P17912	P17755	46	0.014	853.5	853.3	Circular	4.50
LP17912-2	P17912	P17755	46	0.015	861.3	861.3	Natural	1.00
LP17914-1	P17914	P17989	311	0.014	863.9	861.5	Circular	1.75
LP17914-2	P17914	P17989	311	0.015	870.0	868.0	Natural	1.00
LP17950-1	P17950	P17813	100	0.014	860.8	859.8	Circular	0.75
LP17950-2	P17950	P17813	100	0.015	866.1	866.0	Natural	1.00
LP17959-1	P17959	P17745	178	0.014	856.6	855.3	Circular	0.75
LP17959-2	P17959	P17745	178	0.015	861.4	860.8	Natural	1.00
LP17967-1	P17967	P17587	228	0.014	852.7	850.3	Circular	2.25
LP17967-2	P17967	P17587	228	0.015	858.3	857.3	Natural	1.00
LP17987-1	P17987	P17989	149	0.014	862.6	860.9	Circular	0.75
LP17987-2	P17987	P17989	149	0.015	868.1	868.0	Natural	1.00
LP17988-1	P17988	P17912	307	0.014	854.6	853.5	Circular	4.50
LP17988-2	P17988	P17912	307	0.015	862.8	861.3	Natural	1.00
LP17989-1	P17989	P18424	326	0.014	860.3	859.5	Circular	2.00
LP17989-2	P17989	P18424	326	0.015	868.0	866.3	Natural	1.00
LP17996-1	P17996	P17967	203	0.014	853.7	852.7	Circular	2.25
LP17996-2	P17996	P17967	203	0.015	859.8	858.3	Natural	1.00
LP18042-1	P18338	P17988	310	0.014	855.8	854.6	Circular	4.50
LP18042-2	P18338	P17988	310	0.015	864.3	862.8	Natural	1.00
LP18143-1	P18143	P17996	208	0.014	854.9	853.7	Circular	2.25
LP18143-2	P18143	P17996	208	0.015	861.3	859.8	Natural	1.00
LP18247-1	P18247	P18143	42	0.014	854.5	854.7	Circular	1.50
LP18247-2	P18247	P18143	42	0.015	861.4	861.3	Natural	1.00
LP18255-1	P18255	P18247	138	0.014	855.2	854.5	Circular	1.50
LP18255-2	P18255	P18247	138	0.015	861.8	861.4	Natural	1.00
LP18260-1	P18260	P18255	152	0.014	856.0	855.2	Circular	1.50
LP18260-2	P18260	P18255	152	0.015	862.3	861.8	Natural	1.00
LP18270-1	P18270	P18260	28	0.014	856.2	856.0	Circular	1.50
LP18270-2	P18270	P18260	28	0.015	862.4	862.3	Natural	1.00
LP18354-1	P18354	P18363	59	0.014	858.7	858.6	Circular	1.50
LP18354-2	P18354	P18363	59	0.015	865.3	865.4	Natural	1.00
LP18354-3	P18354	P17735	659	0.015	865.3	860.3	Natural	1.00
LP18363-1	P18363	P18383	172	0.014	858.4	857.6	Circular	1.50
LP18363-2	P18363	P18383	172	0.015	865.4	865.8	Natural	1.00
LP18383-1	P18383	P18338	214	0.014	857.6	856.5	Circular	1.50

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LP18383-2	P18383	P18338	214	0.015	865.8	864.3	Natural	1.00
LP18391-1	P18391	P18338	28	0.014	856.5	855.6	Circular	4.00
LP18391-2	P18391	P18338	28	0.015	864.4	864.3	Natural	1.00
LP18398-1	P18398	P18391	183	0.014	857.3	856.5	Circular	4.00
LP18398-2	P18398	P18391	183	0.015	864.4	864.3	Natural	1.00
LP18407-1	P18407	P18398	8	0.014	857.5	857.3	Circular	4.00
LP18407-2	P18407	P18398	8	0.015	864.4	864.3	Natural	1.00
LP18411-1	P18411	P18407	203	0.014	858.4	857.5	Circular	4.00
LP18411-2	P18411	P18407	203	0.015	865.3	864.3	Natural	1.00
LP18412-1	P18412	P18411	22	0.014	858.8	858.4	Circular	4.00
LP18412-2	P18412	P18411	22	0.015	865.4	865.3	Natural	1.00
LP18423-1	P18424	P18412	290	0.014	859.0	858.8	Circular	4.00
LP18423-2	P18424	P18412	290	0.015	866.3	865.3	Natural	1.00
LP18425-1	P18426	P18424	34	0.014	859.1	859.0	Circular	4.00
LP18425-2	P18426	P18424	34	0.015	866.4	866.3	Natural	1.00
LP18433-1	P18433	P18434	20	0.014	860.8	860.3	Circular	3.50
LP18433-2	P18433	P18434	20	0.015	866.9	866.8	Natural	1.00
LP18434-1	P18434	P18426	300	0.014	860.3	859.1	Circular	3.50
LP18434-2	P18434	P18426	300	0.015	866.8	866.3	Natural	1.00
LP18440-1	P18440	P18442	25	0.014	861.6	861.5	Circular	3.00
LP18440-2	P18440	P18442	25	0.015	867.4	867.3	Natural	1.00
LP18442-1	P18442	P18433	299	0.014	861.5	860.8	Circular	3.50
LP18442-2	P18442	P18433	299	0.015	867.3	866.8	Natural	1.00
LP18447-1	P18447	P18440	137	0.014	861.8	861.6	Circular	3.00
LP18447-2	P18447	P18440	137	0.015	867.4	867.3	Natural	1.00
LP18448-1	P18448	P18447	129	0.014	862.0	861.8	Circular	3.00
LP18448-2	P18448	P18447	129	0.015	867.8	867.3	Natural	1.00
LP18450-1	P18450	P18448	28	0.014	862.0	862.0	Circular	3.00
LP18450-2	P18450	P18448	28	0.015	868.3	867.8	Natural	1.00
LP18451-1	P18451	P18450	51	0.014	862.3	861.8	Special	3.65
LP18451-2	P18451	P18450	51	0.015	868.4	868.3	Natural	1.00
LP18454-1	P18454	P18455	21	0.014	863.3	863.4	Circular	2.00
LP18454-2	P18454	P18455	21	0.015	869.4	869.3	Natural	1.00
LP18455-1	P18455	P18451	285	0.014	863.4	862.4	Circular	2.75
LP18455-2	P18455	P18451	285	0.015	869.3	868.3	Natural	1.00
LP18460-1	P18460	P18461	36	0.014	866.0	865.8	Circular	2.00
LP18460-2	P18460	P18461	36	0.015	870.4	870.3	Natural	1.00
LP18461-1	P18461	P18454	309	0.014	865.5	864.7	Circular	2.00
LP18461-2	P18461	P18454	309	0.015	870.3	869.3	Natural	1.00
LP18479-1	P18479	P18270	42	0.014	856.9	856.2	Circular	1.50
LP18479-2	P18479	P18270	42	0.015	862.6	862.3	Natural	1.00
LP18497-1	P18497	P18338	33	0.014	857.5	856.4	Circular	2.50
LP18497-2	P18497	P18338	33	0.015	864.3	864.3	Natural	1.00
LP18503-1	P18503	P18479	14	0.014	857.0	856.9	Circular	1.25
LP18503-2	P18503	P18479	14	0.015	863.1	862.6	Natural	1.00
LP18506-1	P18506	P18503	111	0.014	857.8	857.0	Circular	1.25
LP18506-2	P18506	P18503	111	0.015	864.7	863.1	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LP18510-1	P18510	P18506	141	0.014	860.1	859.0	Circular	1.25
LP18510-2	P18510	P18506	141	0.015	866.6	864.7	Natural	1.00
LP18589-1	P18589	P18434	51	0.014	861.7	861.1	Circular	1.00
LP18589-2	P18589	P18434	51	0.015	867.3	866.8	Natural	1.00
LP18603-1	P18603	P18506	112	0.014	859.3	857.8	Circular	0.75
LP18603-2	P18603	P18506	112	0.015	864.0	864.7	Natural	1.00
LP18610-1	P18610	P18143	222	0.014	856.3	854.9	Circular	1.50
LP18610-2	P18610	P18143	222	0.015	862.3	861.3	Natural	1.00
LP18653-1	P18653	P18589	269	0.014	864.3	861.7	Circular	1.00
LP18653-2	P18653	P18589	269	0.015	873.3	867.3	Natural	1.00
LP18658-1	P18658	P18681	100	0.014	867.8	866.3	Circular	0.75
LP18658-2	P18658	P18681	100	0.015	871.3	872.3	Natural	1.00
LP18670-1	P18670	P18497	337	0.014	859.8	858.5	Circular	2.50
LP18670-2	P18670	P18497	337	0.015	868.3	864.3	Natural	1.00
LP18671-1	P18671	P18699	150	0.014	854.8	854.1	Circular	0.75
LP18671-2	P18671	P18699	150	0.015	0.0	0.0	Natural	1.00
LP18678-1	P18678	P18610	229	0.014	857.3	856.3	Circular	1.50
LP18678-2	P18678	P18610	229	0.015	863.8	862.3	Natural	1.00
LP18681-1	P18681	P19003	218	0.014	866.3	863.4	Circular	0.75
LP18681-2	P18681	P19003	218	0.015	872.3	869.5	Natural	1.00
LP18699-1	P18699	P18882	123	0.014	854.1	853.4	Circular	0.75
LP18699-2	P18699	P18882	123	0.015	0.0	0.0	Natural	1.00
LP18748-1	P18950	P18678	255	0.014	858.2	857.3	Circular	1.50
LP18748-2	P18950	P18678	255	0.015	865.6	863.8	Natural	1.00
LP18795-1	P18795	P18670	266	0.014	860.8	859.8	Circular	2.50
LP18795-2	P18795	P18670	266	0.015	867.3	868.3	Natural	1.00
LP18854-1	P18854	P18653	307	0.014	866.7	864.3	Circular	1.00
LP18854-2	P18854	P18653	307	0.015	874.3	873.3	Natural	1.00
LP18882-1	P18882	P19066	18	0.014	853.4	853.3	Circular	0.75
LP18882-2	P18882	P19066	18	0.015	0.0	866.1	Natural	1.00
LP18943-1	P18943	P18795	20	0.014	860.9	860.8	Circular	2.50
LP18943-2	P18943	P18795	20	0.015	867.3	867.3	Natural	1.00
LP18949-1	P18953	P18950	97	0.014	859.3	858.6	Circular	1.25
LP18949-2	P18953	P18950	97	0.015	865.9	865.6	Natural	1.00
LP19003-1	P19003	P18943	207	0.014	862.3	861.3	Circular	1.00
LP19003-2	P19003	P18943	207	0.015	869.5	867.3	Natural	1.00
LP19019-1	P19019	P19066	144	0.014	860.4	859.6	Circular	1.25
LP19019-2	P19019	P19066	144	0.015	866.5	866.1	Natural	1.00
LP19021-1	P19021	P19019	44	0.014	860.7	860.4	Circular	1.25
LP19021-2	P19021	P19019	44	0.015	866.6	866.5	Natural	1.00
LP19021-3	P19021	P18479	640	0.015	866.5	862.6	Natural	1.00
LP19051-1	P19051	P19021	133	0.014	861.6	860.7	Circular	1.00
LP19051-2	P19051	P19021	133	0.015	866.8	866.6	Natural	1.00
LP19066-1	P19066	P18953	49	0.014	859.6	859.3	Circular	1.25
LP19066-2	P19066	P18953	49	0.015	866.1	865.9	Natural	1.00
LP19070-1	P19070	P19051	220	0.014	862.0	861.6	Circular	1.00
LP19070-2	P19070	P19051	220	0.015	867.3	866.8	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LP19070-3	P19070	P18510	638	0.015	867.3	866.6	Natural	1.00
LP19092-1	P19092	P18943	36	0.014	863.3	861.9	Circular	1.00
LP19092-2	P19092	P18943	36	0.015	867.4	867.3	Natural	1.00
LP19097-1	P19097	P19092	188	0.014	866.9	863.3	Circular	1.00
LP19097-2	P19097	P19092	188	0.015	870.8	867.4	Natural	1.00
LP19101-1	P19101	P19097	243	0.014	870.1	866.9	Circular	1.00
LP19101-2	P19101	P19097	243	0.015	874.3	870.8	Natural	1.00
LP19101-3	P19101	P18411	670	0.015	874.3	865.3	Natural	1.00
LP19131-1	P19131	P19137	135	0.014	869.8	868.7	Circular	1.00
LP19131-2	P19131	P19137	135	0.015	874.8	874.3	Natural	1.00
LP19137-1	P19137	P18854	51	0.014	868.7	866.7	Circular	1.00
LP19137-2	P19137	P18854	51	0.015	874.3	874.3	Natural	1.00
LP19143-1	P19143	P19145	136	0.014	871.8	871.2	Circular	1.00
LP19143-2	P19143	P19145	136	0.015	876.1	875.8	Natural	1.00
LP19144-1	P19144	P19131	204	0.014	870.3	869.8	Circular	1.00
LP19144-2	P19144	P19131	204	0.015	875.3	874.8	Natural	1.00
LP19144-3	P19144	P18442	673	0.015	875.3	867.3	Natural	1.00
LP19145-1	P19145	P19144	123	0.014	871.2	871.1	Circular	1.00
LP19145-2	P19145	P19144	123	0.015	875.8	875.3	Natural	1.00
LP19147-1	P19147	P19143	87	0.014	872.3	871.8	Circular	1.00
LP19147-2	P19147	P19143	87	0.015	876.6	876.1	Natural	1.00
LP19147-3	P19147	P18451	671	0.015	876.6	868.3	Natural	1.00
LP19148-1	P19148	P19149	151	0.014	873.5	872.7	Circular	1.00
LP19148-2	P19148	P19149	151	0.015	877.3	876.8	Natural	1.00
LP19148-3	P19148	P18454	671	0.015	877.3	869.3	Natural	1.00
LP19149-1	P19149	P19147	134	0.014	872.7	872.3	Circular	1.00
LP19149-2	P19149	P19147	134	0.015	876.8	876.6	Natural	1.00
LP19155-1	P19155	P18943	36	0.014	862.7	862.4	Circular	1.00
LP19155-2	P19155	P18943	36	0.015	867.8	867.3	Natural	1.00
LP19214-1	P19214	P19155	117	0.014	863.5	862.7	Circular	1.00
LP19214-2	P19214	P19155	117	0.015	867.4	867.8	Natural	1.00
LR113-1	R113	R94	361	0.014	830.1	829.8	Special	4.50
LR113-2	R113	R94	361	0.015	837.3	838.8	Natural	1.00
LR12-1	R12	R13	273	0.014	850.6	845.1	Circular	1.00
LR121-1	R126	R124	140	0.014	836.2	833.6	Circular	1.25
LR121-2	R126	R124	140	0.015	843.3	840.7	Natural	1.00
LR12-2	R12	R13	273	0.015	859.7	852.1	Natural	1.00
LR124-1	R124	R127	137	0.014	833.6	831.1	Circular	1.25
LR124-2	R124	R127	137	0.015	840.7	837.3	Natural	1.00
LR127-1	R127	R128	42	0.014	831.1	830.6	Circular	1.25
LR127-2	R127	R128	42	0.015	837.3	836.3	Natural	1.00
LR128-1	R128	R132	280	0.014	830.6	830.3	Special	3.75
LR128-2	R128	R132	280	0.015	836.3	836.3	Natural	1.00
LR130-1	R130	R126	66	0.014	836.9	836.2	Circular	1.25
LR130-2	R130	R126	66	0.015	844.5	843.3	Natural	1.00
LR13-1	R13	R33	299	0.014	845.1	839.3	Circular	1.00
LR13-2	R13	R33	299	0.015	852.1	845.9	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LR132-1	R132	R136	53	0.014	830.3	830.3	Circular	5.00
LR132-2	R132	R136	53	0.015	836.3	836.3	Natural	1.00
LR134-1	R134	R130	309	0.014	856.3	838.6	Circular	1.00
LR134-2	R134	R130	309	0.015	872.8	844.5	Natural	1.00
LR137-1	R136	R139	287	0.014	830.3	830.1	Special	4.50
LR137-2	R136	R139	287	0.015	836.3	837.3	Natural	1.00
LR139-1	R139	R113	27	0.014	830.1	830.1	Special	4.50
LR139-2	R139	R113	27	0.015	837.3	837.4	Natural	1.00
LR14	R14	R43	151	0.014	841.8	840.3	Circular	0.75
LR140-1	R140	R113	173	0.014	833.4	832.3	Circular	1.75
LR140-2	R140	R113	173	0.015	839.3	837.3	Natural	1.00
LR141-1	R141	R140	144	0.014	834.4	833.4	Circular	1.75
LR141-2	R141	R140	144	0.015	841.3	839.3	Natural	1.00
LR142-1	R142	R141	48	0.014	836.2	834.4	Circular	1.00
LR142-2	R142	R141	48	0.015	841.3	841.3	Natural	1.00
LR143-1	R143	R142	144	0.014	837.9	836.2	Circular	1.00
LR143-2	R143	R142	144	0.015	845.8	841.3	Natural	1.00
LR144-1	R144	R143	157	0.014	845.0	837.9	Circular	1.00
LR144-2	R144	R143	157	0.015	850.3	845.8	Natural	1.00
LR153-1	R161	R128	49	0.014	830.6	830.5	Special	2.60
LR153-2	R161	R128	49	0.015	837.3	836.3	Natural	1.00
LR168-1	R175	R161	584	0.014	831.2	830.6	Circular	4.50
LR168-2	R175	R161	584	0.015	837.8	837.3	Natural	1.00
LR172-1	R172	R200	101	0.014	837.3	836.7	Circular	0.75
LR172-2	R172	R200	101	0.015	841.1	841.0	Natural	1.00
LR191-1	R191	R175	306	0.014	831.3	831.1	Circular	4.50
LR191-2	R191	R175	306	0.015	837.5	837.8	Natural	1.00
LR193-1	R193	R175	47	0.014	831.6	831.3	Circular	1.75
LR193-2	R193	R175	47	0.015	837.9	837.8	Natural	1.00
LR194-1	R194	R195	38	0.014	832.0	831.5	Circular	3.00
LR194-2	R194	R195	38	0.015	837.3	837.4	Natural	1.00
LR195-1	R195	R191	24	0.014	831.5	831.3	Circular	3.00
LR195-2	R195	R191	24	0.015	837.4	837.5	Natural	1.00
LR196-1	R196	R193	137	0.014	832.0	831.6	Circular	1.50
LR196-2	R196	R193	137	0.015	837.9	837.9	Natural	1.00
LR197-1	R197	R199	35	0.014	846.8	846.2	Circular	1.25
LR197-2	R197	R199	35	0.015	852.8	849.8	Natural	1.00
LR198-1	R198	R196	123	0.014	832.4	832.0	Circular	1.50
LR198-2	R198	R196	123	0.015	838.1	837.9	Natural	1.00
LR199-1	R199	R200	148	0.014	846.2	838.7	Circular	1.25
LR199-2	R199	R200	148	0.015	849.8	844.9	Natural	1.00
LR200-1	R200	R194	149	0.014	836.7	832.2	Circular	1.25
LR200-2	R200	R194	149	0.015	844.9	837.3	Natural	1.00
LR201-1	R201	R198	46	0.014	832.6	832.4	Circular	1.50
LR201-2	R201	R198	46	0.015	838.3	838.1	Natural	1.00
LR202-1	R202	R201	24	0.014	833.1	832.6	Circular	1.00
LR202-2	R202	R201	24	0.015	838.3	838.3	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LR205-1	R205	R202	140	0.014	836.3	833.1	Circular	1.00
LR205-2	R205	R202	140	0.015	842.4	838.3	Natural	1.00
LR206-1	R206	R205	171	0.014	840.3	836.3	Circular	1.00
LR206-2	R206	R205	171	0.015	846.3	842.4	Natural	1.00
LR206-3	R206	R113	678	0.015	846.3	837.3	Natural	1.00
LR231-1	R231	R194	202	0.014	832.5	832.0	Circular	2.50
LR231-2	R231	R194	202	0.015	837.6	837.3	Natural	1.00
LR232-1	R232	R231	210	0.014	832.8	832.5	Circular	2.50
LR232-2	R232	R231	210	0.015	838.0	837.6	Natural	1.00
LR233-1	R233	R234	97	0.014	836.3	835.9	Circular	0.75
LR233-2	R233	R234	97	0.015	839.8	840.3	Natural	1.00
LR234-1	R234	R268	140	0.014	835.9	835.3	Circular	0.75
LR234-2	R234	R268	140	0.015	840.3	840.9	Natural	1.00
LR242-1	R242	R232	217	0.014	833.2	832.8	Circular	2.50
LR242-2	R242	R232	217	0.015	839.1	838.0	Natural	1.00
LR254-1	R254	R242	75	0.014	833.3	832.9	Circular	1.50
LR254-2	R254	R242	75	0.015	839.1	839.1	Natural	1.00
LR255-1	R255	R254	325	0.014	835.2	833.3	Circular	1.50
LR255-2	R255	R254	325	0.015	839.7	839.1	Natural	1.00
LR256-1	R261	R255	264	0.014	836.4	835.3	Circular	1.25
LR256-2	R261	R255	264	0.015	840.7	839.7	Natural	1.00
LR258-1	R258	R259	152	0.014	849.3	847.2	Circular	1.00
LR258-2	R258	R259	152	0.015	855.3	853.2	Natural	1.00
LR259-1	R259	R260	141	0.014	847.2	845.3	Circular	1.00
LR259-2	R259	R260	141	0.015	853.2	851.3	Natural	1.00
LR260-1	R260	R262	56	0.014	844.8	844.1	Circular	1.25
LR260-2	R260	R262	56	0.015	851.3	851.3	Natural	1.00
LR262-1	R262	R264	16	0.014	844.1	843.7	Circular	1.25
LR262-2	R262	R264	16	0.015	851.3	851.3	Natural	1.00
LR263-1	R263	R261	46	0.014	837.0	836.9	Circular	1.00
LR263-2	R263	R261	46	0.015	840.3	840.7	Natural	1.00
LR264-1	R264	R265	134	0.014	843.7	839.6	Circular	1.25
LR264-2	R264	R265	134	0.015	851.3	846.6	Natural	1.00
LR265-1	R265	R266	153	0.014	839.6	834.8	Circular	1.25
LR265-2	R265	R266	153	0.015	846.6	841.3	Natural	1.00
LR266-1	R266	R268	154	0.014	834.8	834.0	Circular	2.00
LR266-2	R266	R268	154	0.015	841.3	840.9	Natural	1.00
LR267-1	R267	R242	20	0.014	833.4	833.0	Circular	2.00
LR267-2	R267	R242	20	0.015	839.2	839.1	Natural	1.00
LR268-1	R268	R267	91	0.014	834.0	833.4	Circular	2.00
LR268-2	R268	R267	91	0.015	840.9	839.2	Natural	1.00
LR33-1	R33	R69	37	0.014	839.3	838.9	Circular	1.00
LR33-2	R33	R69	37	0.015	845.9	845.3	Natural	1.00
LR43	R43	R48	126	0.014	840.3	833.8	Circular	0.75
LR48-1	R48	R58	29	0.014	833.5	833.1	Circular	1.25
LR48-2	R48	R58	29	0.015	840.0	840.0	Natural	1.00
LR49-1	R49	R51	52	0.014	847.4	847.2	Circular	2.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LR49-2	R49	R51	52	0.015	858.3	858.3	Natural	1.00
LR50-1	R50	R52	34	0.014	845.2	844.7	Circular	1.75
LR50-2	R50	R52	34	0.015	854.7	854.7	Natural	1.00
LR50-3	R50	R127	648	0.015	854.7	837.3	Natural	1.00
LR51-1	R51	R50	291	0.014	847.2	845.2	Circular	2.00
LR51-2	R51	R50	291	0.015	858.3	854.7	Natural	1.00
LR52-1	R52	R56	297	0.014	844.7	840.6	Circular	1.75
LR52-2	R52	R56	297	0.015	854.7	847.8	Natural	1.00
LR53-1	R53	R49	274	0.014	849.1	847.4	Circular	2.00
LR53-2	R53	R49	274	0.015	856.3	858.3	Natural	1.00
LR54-1	R54	R82	25	0.014	827.7	827.3	Circular	1.75
LR54-2	R54	R82	25	0.015	834.3	834.6	Natural	1.00
LR56-1	R56	R57	37	0.014	840.6	840.0	Circular	2.00
LR56-2	R56	R57	37	0.015	847.8	847.3	Natural	1.00
LR56-3	R56	R136	652	0.015	847.8	836.3	Natural	1.00
LR57-1	R57	R60	154	0.014	840.0	838.3	Circular	2.00
LR57-2	R57	R60	154	0.015	847.3	845.7	Natural	1.00
LR58-1	R58	R78	46	0.014	833.1	832.6	Circular	1.25
LR58-2	R58	R78	46	0.015	840.0	839.7	Natural	1.00
LR60-1	R60	R61	138	0.014	833.5	833.2	Circular	2.25
LR60-2	R60	R61	138	0.015	845.7	844.3	Natural	1.00
LR6-1	R6	R9	48	0.014	853.0	852.9	Special	1.13
LR61-1	R61	R77	35	0.014	833.2	832.8	Circular	2.25
LR61-2	R61	R77	35	0.015	844.3	844.3	Natural	1.00
LR6-2	R6	R9	48	0.015	860.6	860.3	Natural	1.00
LR66-1	R77	R69	331	0.014	829.6	829.5	Circular	6.50
LR66-2	R77	R69	331	0.015	844.3	845.3	Natural	1.00
LR69-1	R69	R70	302	0.014	829.5	829.1	Circular	6.50
LR69-2	R69	R70	302	0.015	845.3	852.3	Natural	1.00
LR69-3	R69	R142	645	0.015	845.3	841.3	Natural	1.00
LR70-1	R70	R72	18	0.014	829.1	823.7	Special	4.50
LR70-2	R70	R72	18	0.015	852.3	852.3	Natural	1.00
LR7-1	R7	R6	131	0.014	853.5	853.0	Circular	1.50
LR7-2	R7	R6	131	0.015	860.6	860.6	Natural	1.00
LR75-1	R72	DS1(39th)	213	0.014	823.7	823.5	Special	4.50
LR75-2	R72	DS1(39th)	187	0.015	852.3	837.6	Natural	1.00
LR78-1	R78	R81	22	0.014	832.6	832.6	Circular	1.25
LR78-2	R78	R81	22	0.015	839.7	839.7	Natural	1.00
LR8-1	R8	R7	153	0.014	858.0	855.9	Circular	1.00
LR81-1	R81	R83	12	0.014	832.6	832.6	Circular	0.83
LR81-2	R81	R83	12	0.015	839.7	839.7	Natural	1.00
LR8-2	R8	R7	153	0.015	860.8	860.6	Natural	1.00
LR82-1	R82	R86	76	0.014	827.0	826.8	Circular	4.00
LR82-2	R82	R86	76	0.015	834.6	836.3	Natural	1.00
LR83-1	R83	R89	8	0.014	832.6	826.3	Circular	0.83
LR83-2	R83	R89	8	0.015	839.7	839.3	Natural	1.00
LR86-1	R86	R89	171	0.014	824.9	824.3	Circular	8.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LR86-2	R86	R89	171	0.015	836.3	839.3	Natural	1.00
LR89-1	R89	R90	5	0.014	823.7	823.7	Circular	2.00
LR89-2	R89	R90	5	0.015	839.3	839.6	Natural	1.00
LR90-1	R90	R53	235	0.014	831.6	846.4	Circular	1.33
LR90-2	R90	R53	235	0.015	839.6	850.3	Natural	1.00
LR9-1	R9	R12	55	0.014	852.9	851.8	Circular	1.50
LR9-2	R9	R12	55	0.015	860.3	859.7	Natural	1.00
LR93-1	R93	R60	167	0.014	835.8	833.7	Circular	0.75
LR93-2	R93	R60	167	0.015	839.6	845.7	Natural	1.00
LR94-1	R94	R77	258	0.014	829.8	829.6	Circular	6.00
LR94-2	R94	R77	258	0.015	838.8	844.3	Natural	1.00
LR95-1	R95	R143	185	0.014	838.3	837.9	Circular	0.75
LR95-2	R95	R143	185	0.015	842.0	845.8	Natural	1.00
LS100.1	V14521-2	MH136	74	0.014	871.2	868.2	Circular	1.25
LS100.2	V14521-2	MH136	74	0.015	876.1	875.1	Natural	1.00
LS101.1	V14521-1	MH136	47	0.014	868.5	868.2	Circular	1.25
LS101.2	V14521-1	MH136	47	0.015	875.6	875.1	Natural	1.00
LS102.1	MH136	MH140	156	0.014	868.8	868.6	Circular	3.00
LS102.2	MH136	MH140	156	0.015	875.9	875.4	Natural	1.00
LS103.1	MH140	MH143	98	0.014	868.6	868.5	Circular	3.00
LS103.2	MH140	MH143	98	0.015	875.4	875.2	Natural	1.00
LS104.1	MH143	V14500-1	83	0.014	868.5	868.5	Circular	3.00
LS104.2	MH143	V14500-1	83	0.015	875.2	874.9	Natural	1.00
LS105.1	V14500.1	MH155A	234	0.014	868.0	867.6	Special	3.00
LS106.1	MH155A	MH156	42	0.014	867.6	867.6	Special	3.00
LS106.2	MH155A	MH156	42	0.015	874.3	874.2	Natural	1.00
LS107.1	MH156	V14356	57	0.014	867.6	867.5	Special	3.00
LS107.2	MH156	V14356	57	0.015	874.2	874.0	Natural	1.00
LS109.1	V14356-1	V14356	55	0.013	869.9	869.7	Circular	1.50
LS109.2	V14356-1	V14356	45	0.015	874.2	874.0	Natural	1.00
LS110.1	V14356	MH169	235	0.014	867.5	866.9	Special	3.00
LS110.2	V14356	MH169	235	0.015	874.0	873.3	Natural	1.00
LS111.1	MH169	V14497	64	0.014	866.9	866.7	Special	3.00
LS111.2	MH169	V14497	64	0.015	873.3	873.2	Natural	1.00
LS112.1	MH173	MH178	235	0.014	865.1	864.7	Circular	4.50
LS113.1	MH178	MH181	134	0.014	864.7	864.4	Circular	4.50
LS113.2	MH178	MH181	134	0.015	872.6	872.3	Natural	1.00
LS114.1	MH181	M14298	85	0.014	864.4	864.3	Circular	4.50
LS114.2	MH181	M14298	85	0.015	872.3	872.1	Natural	1.00
LS115.1	MH185	MH187	212	0.014	864.3	863.8	Circular	4.50
LS116.1	MH187	M14368-2	31	0.014	863.8	863.7	Circular	4.50
LS116.2	MH187	M14368-2	31	0.015	871.6	871.6	Natural	1.00
LS117.1	M14368-2	MH192	132	0.014	863.7	863.4	Circular	4.50
LS117.2	M14368-2	MH192	132	0.015	871.6	871.3	Natural	1.00
LS118.1	V14356-2	V14356	45	0.014	870.1	870.0	Special	1.50
LS118.2	V14356-2	V14356	45	0.015	874.2	874.0	Natural	1.00
LS119.1	MH192	GC3	12	0.014	863.4	863.4	Circular	4.50

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LS119.2	MH192	GC3	12	0.015	871.3	871.3	Natural	1.00
LS120.1	GC3	MH195	55	0.014	863.4	863.3	Circular	4.50
LS120.2	GC3	MH195	55	0.015	871.3	871.0	Natural	1.00
LS121.1	MH195	M14368-1	18	0.014	863.3	862.8	Circular	2.00
LS121.2	MH195	M14368-1	18	0.015	871.0	871.0	Natural	1.00
LT19194-1	T19194	T19249	222	0.014	871.0	870.5	Circular	1.50
LT19194-2	T19194	T19249	222	0.015	875.3	875.1	Natural	1.00
LT19194-3	T19194	V19138	385	0.015	875.3	871.1	Natural	1.00
LT19249-1	T19249	T19298	243	0.014	870.5	870.5	Circular	1.50
LT19249-2	T19249	T19298	243	0.015	875.1	874.8	Natural	1.00
LT19290-1	T19290	T19295	115	0.014	861.1	858.8	Circular	0.75
LT19290-2	T19290	T19295	115	0.015	868.1	865.9	Natural	1.00
LT19291-1	T19291	T19290	123	0.014	862.3	861.1	Circular	0.75
LT19291-2	T19291	T19290	123	0.015	866.3	868.1	Natural	1.00
LT19295-1	T19295	T19437	121	0.014	858.8	858.2	Circular	1.00
LT19295-2	T19295	T19437	121	0.015	865.9	865.5	Natural	1.00
LT19298-1	T19298	T19718	164	0.014	870.5	870.4	Circular	1.50
LT19298-2	T19298	T19718	164	0.015	874.8	874.6	Natural	1.00
LT19316-1	T19316	T19713	170	0.014	870.7	869.8	Circular	1.25
LT19316-2	T19316	T19713	170	0.015	875.8	875.1	Natural	1.00
LT19437-1	T19437	T19491	24	0.014	858.2	857.5	Circular	1.00
LT19437-2	T19437	T19491	24	0.015	865.5	865.3	Natural	1.00
LT19491-1	T19491	T19811	68	0.014	857.5	857.3	Circular	1.75
LT19491-2	T19491	T19811	68	0.015	865.3	865.3	Natural	1.00
LT19495-1	T19495	T19491	139	0.014	857.9	857.5	Circular	1.50
LT19495-2	T19495	T19491	139	0.015	865.8	865.3	Natural	1.00
LT19507-1	T19507	T19510	24	0.014	858.9	858.3	Circular	1.50
LT19507-2	T19507	T19510	24	0.015	866.1	866.3	Natural	1.00
LT19510-1	T19510	T19495	167	0.014	858.3	857.9	Circular	1.50
LT19510-2	T19510	T19495	167	0.015	866.3	865.8	Natural	1.00
LT19511-1	T19511	T19507	140	0.014	859.3	858.9	Circular	1.50
LT19511-2	T19511	T19507	140	0.015	865.8	866.1	Natural	1.00
LT19513-1	T19513	T19511	150	0.014	859.8	859.3	Circular	1.50
LT19513-2	T19513	T19511	150	0.015	865.3	865.8	Natural	1.00
LT19513-3	T19513	T20349	674	0.015	865.3	850.1	Natural	1.00
LT19638-1	T19638	T19825	39	0.014	853.3	853.1	Circular	3.50
LT19638-2	T19638	T19825	39	0.015	860.7	860.1	Natural	1.00
LT19641-1	T19641	T19638	394	0.014	855.2	853.9	Circular	3.50
LT19641-2	T19641	T19638	394	0.015	869.1	860.7	Natural	1.00
LT19643-1	T19643	T19641	54	0.014	855.4	855.2	Circular	3.50
LT19643-2	T19643	T19641	54	0.015	869.2	869.1	Natural	1.00
LT19643-3	T19643	T20452	655	0.015	869.1	865.8	Natural	1.00
LT19666-1	T19666	T19643	227	0.014	857.1	855.4	Circular	3.50
LT19666-2	T19666	T19643	227	0.015	870.1	869.1	Natural	1.00
LT19672-1	T19672	T19666	150	0.014	858.5	857.7	Circular	3.50
LT19672-2	T19672	T19666	150	0.015	870.3	870.1	Natural	1.00
LT19678-1	T19678	T19672	38	0.014	858.6	858.5	Circular	3.50

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LT19678-2	T19678	T19672	38	0.015	870.3	870.3	Natural	1.00
LT19695-1	T19695	T19678	298	0.014	862.5	861.0	Circular	3.50
LT19695-2	T19695	T19678	298	0.015	871.3	870.3	Natural	1.00
LT19696-1	T19696	T19695	40	0.014	862.7	862.5	Circular	3.50
LT19696-2	T19696	T19695	40	0.015	871.4	871.3	Natural	1.00
LT19701-1	T19701	T19696	296	0.014	863.6	862.7	Circular	3.50
LT19701-2	T19701	T19696	296	0.015	872.3	871.3	Natural	1.00
LT19703-1	T19703	T19701	32	0.014	863.7	863.6	Circular	3.50
LT19703-2	T19703	T19701	32	0.015	872.4	872.3	Natural	1.00
LT19704-1	T19704	T19703	311	0.014	864.4	863.7	Circular	3.50
LT19704-2	T19704	T19703	311	0.015	873.3	872.3	Natural	1.00
LT19705-1	T19705	T19704	30	0.014	864.5	864.4	Circular	3.50
LT19705-2	T19705	T19704	30	0.015	873.3	873.3	Natural	1.00
LT19708-1	T19708	T19705	282	0.014	865.2	864.5	Circular	3.00
LT19708-2	T19708	T19705	282	0.015	873.8	873.3	Natural	1.00
LT19709-1	T19709	T19713	166	0.014	869.6	869.3	Circular	1.75
LT19709-2	T19709	T19713	166	0.015	875.3	875.1	Natural	1.00
LT19710-1	T19710	T19708	60	0.014	866.7	865.3	Circular	2.50
LT19710-2	T19710	T19708	60	0.015	873.8	873.8	Natural	1.00
LT19712-1	T19712	T19710	24	0.014	867.8	866.7	Circular	2.50
LT19712-2	T19712	T19710	24	0.015	873.8	873.8	Natural	1.00
LT19713-1	T19713	T19716	125	0.014	869.3	869.1	Circular	1.75
LT19713-2	T19713	T19716	125	0.015	875.1	874.8	Natural	1.00
LT19714-1	T19714	T19709	45	0.014	869.9	869.6	Circular	1.75
LT19714-2	T19714	T19709	45	0.015	875.3	875.3	Natural	1.00
LT19715-1	T19715	T19712	124	0.014	868.5	867.8	Circular	2.50
LT19715-2	T19715	T19712	124	0.015	874.3	873.8	Natural	1.00
LT19716-1	T19716	T19717	28	0.014	869.1	869.1	Circular	2.50
LT19716-2	T19716	T19717	28	0.015	874.8	874.8	Natural	1.00
LT19717-1	T19717	T19715	141	0.014	869.1	868.5	Circular	2.50
LT19717-2	T19717	T19715	141	0.015	874.8	874.3	Natural	1.00
LT19718-1	T19718	T19714	286	0.014	870.4	869.9	Circular	1.75
LT19718-2	T19718	T19714	286	0.015	874.6	875.3	Natural	1.00
LT19718-3	T19718	V19728	403	0.015	874.6	865.5	Natural	1.00
LT19825-1	T19825	T19855	22	0.014	853.1	852.7	Special	1.67
LT19825-2	T19825	T19855	22	0.015	860.1	859.6	Natural	1.00
LT19855-1	T19855	T19918	305	0.014	852.7	849.3	Circular	3.50
LT19855-2	T19855	T19918	305	0.015	859.6	855.5	Natural	1.00
LT19868-1	T19811	T19885	202	0.014	857.3	856.7	Circular	1.75
LT19868-2	T19811	T19885	202	0.015	865.3	866.1	Natural	1.00
LT19878-1	T19878	T19909	144	0.014	858.6	857.8	Circular	0.75
LT19878-2	T19878	T19909	144	0.015	862.3	862.6	Natural	1.00
LT19878-3	T19878	T19918	265	0.015	862.3	855.5	Natural	1.00
LT19885-1	T19885	T19940	213	0.014	856.7	856.0	Circular	1.75
LT19885-2	T19885	T19940	213	0.015	866.1	865.1	Natural	1.00
LT19909-1	T19909	T19950	162	0.014	857.8	857.1	Circular	0.75
LT19909-2	T19909	T19950	162	0.015	862.6	863.1	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LT19918-1	T19918	T20470	302	0.014	849.1	846.9	Circular	4.00
LT19918-2	T19918	T20470	302	0.015	855.5	857.3	Natural	1.00
LT19940-1	T19940	T20163	187	0.014	856.0	855.4	Circular	1.75
LT19940-2	T19940	T20163	187	0.015	865.1	863.3	Natural	1.00
LT19946-1	T19946	T20465	183	0.014	866.3	865.5	Circular	1.00
LT19946-2	T19946	T20465	183	0.015	869.7	870.9	Natural	1.00
LT19950-1	T19950	T20429	149	0.014	857.1	856.3	Circular	0.75
LT19950-2	T19950	T20429	149	0.015	863.1	861.6	Natural	1.00
LT20163-1	T20163	T20468	26	0.014	855.4	854.3	Circular	1.75
LT20163-2	T20163	T20468	26	0.015	863.3	863.3	Natural	1.00
LT20349-1	T20349	T20358	72	0.014	839.8	839.7	Circular	6.50
LT20349-2	T20349	T20358	72	0.015	850.1	850.0	Natural	1.00
LT20349-3	T20358	U20747	302	0.015	850.0	845.0	Natural	1.00
LT20353-1	T20353	T20476	123	0.014	839.7	839.4	Circular	6.50
LT20353-2	T20353	T20476	123	0.015	850.2	851.5	Natural	1.00
LT20357-1	T20357	T20349	20	0.014	839.9	839.8	Circular	6.00
LT20357-2	T20357	T20349	20	0.015	850.1	850.0	Natural	1.00
LT20358-1	T20358	T20353	17	0.014	839.7	839.7	Circular	6.50
LT20358-2	T20358	T20353	17	0.015	850.0	850.2	Natural	1.00
LT20375-1	T20375	T20477	34	0.014	849.0	848.7	Circular	3.00
LT20375-2	T20375	T20477	34	0.015	857.6	857.3	Natural	1.00
LT20405-1	T20405	T20357	173	0.014	841.1	839.9	Circular	6.00
LT20405-2	T20405	T20357	173	0.015	853.1	850.1	Natural	1.00
LT20429-1	T20429	T20375	160	0.014	852.1	849.0	Circular	3.00
LT20429-2	T20429	T20375	160	0.015	861.6	857.6	Natural	1.00
LT20452-1	T20452	T20454	39	0.014	859.3	857.9	Special	2.22
LT20452-2	T20452	T20454	39	0.015	865.8	865.6	Natural	1.00
LT20454-1	T20454	T20429	212	0.014	857.9	853.6	Circular	3.00
LT20454-2	T20454	T20429	212	0.015	865.6	861.6	Natural	1.00
LT20459-1	T20459	T20405	244	0.014	845.0	842.6	Circular	6.00
LT20459-2	T20459	T20405	244	0.015	856.6	853.1	Natural	1.00
LT20461-1	T20461	T20452	396	0.014	863.6	859.8	Circular	3.00
LT20461-2	T20461	T20452	396	0.015	870.1	865.8	Natural	1.00
LT20463-1	T20463	T20461	33	0.014	863.8	863.6	Circular	3.00
LT20463-2	T20463	T20461	33	0.015	870.6	870.1	Natural	1.00
LT20465-1	T20465	T20466	8	0.014	864.7	864.7	Circular	3.00
LT20465-2	T20465	T20466	8	0.015	871.1	870.9	Natural	1.00
LT20466-1	T20466	T20463	148	0.014	864.7	863.8	Circular	3.00
LT20466-2	T20466	T20463	148	0.015	870.9	870.6	Natural	1.00
LT20467-1	T20473	T20468	318	0.014	838.9	838.1	Circular	6.50
LT20467-2	T20473	T20468	318	0.015	853.6	863.3	Natural	1.00
LT20468-1	T20468	DS1(39th)	147	0.014	827.3	826.8	Circular	7.00
LT20468-2	T20468	DS1(39th)	147	0.015	863.3	837.6	Natural	1.00
LT20470-1	T20470	T20459	36	0.014	845.1	845.0	Circular	6.00
LT20470-2	T20470	T20459	36	0.015	857.3	856.6	Natural	1.00
LT20476-1	T20476	T20473	182	0.014	839.4	838.9	Circular	6.50
LT20476-2	T20476	T20473	182	0.015	851.5	853.6	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LT20477-1	T20477	T20470	22	0.014	846.1	846.1	Circular	5.50
LT20477-2	T20477	T20470	22	0.015	857.3	857.3	Natural	1.00
LT20481-1	T20481	T20483	45	0.014	865.2	864.9	Circular	3.00
LT20481-2	T20481	T20483	45	0.015	871.3	871.1	Natural	1.00
LT20483-1	T20483	T20465	135	0.014	864.9	864.7	Circular	3.00
LT20483-2	T20483	T20465	135	0.015	871.1	870.9	Natural	1.00
LT20498-1	T20498	T20481	301	0.014	866.4	865.2	Circular	3.00
LT20498-2	T20498	T20481	301	0.015	873.0	871.3	Natural	1.00
LT20499-1	T20499	T20498	22	0.014	866.5	866.4	Circular	3.00
LT20499-2	T20499	T20498	22	0.015	873.1	873.0	Natural	1.00
LT20507-1	T20507	T20520	290	0.014	869.0	868.1	Circular	2.25
LT20507-2	T20507	T20520	290	0.015	874.8	873.3	Natural	1.00
LT20511-1	T20511	T20507	62	0.014	869.3	869.0	Circular	2.25
LT20511-2	T20511	T20507	62	0.015	874.8	874.8	Natural	1.00
LT20520-1	T20520	T20530	28	0.014	867.8	868.0	Circular	2.50
LT20520-2	T20520	T20530	28	0.015	873.4	873.3	Natural	1.00
LT20524-1	T20524	T20511	280	0.014	870.2	869.5	Circular	2.00
LT20524-2	T20524	T20511	280	0.015	875.8	874.8	Natural	1.00
LT20530-1	T20530	T20499	315	0.014	868.0	866.9	Circular	2.50
LT20530-2	T20530	T20499	315	0.015	873.3	873.1	Natural	1.00
LT20531-1	T20531	T20524	36	0.014	870.6	870.2	Circular	2.00
LT20531-2	T20531	T20524	36	0.015	875.8	875.8	Natural	1.00
LT20531-3	T20531	T19716	656	0.015	875.8	874.8	Natural	1.00
LT20551-1	T20551	T20531	284	0.014	871.5	870.6	Circular	2.00
LT20551-2	T20551	T20531	284	0.015	877.1	875.8	Natural	1.00
LT20568-1	T20568	T20405	24	0.014	843.1	842.1	Circular	1.00
LT20568-2	T20568	T20405	24	0.015	852.4	853.1	Natural	1.00
LT20621-1	T20621	T20466	25	0.014	864.8	864.7	Circular	1.00
LT20621-2	T20621	T20466	25	0.015	870.8	870.9	Natural	1.00
LT20640-1	T20640	T20454	37	0.014	858.2	857.9	Circular	1.00
LT20640-2	T20640	T20454	37	0.015	865.7	865.6	Natural	1.00
LT20706-1	T20706	T20640	100	0.014	858.7	858.2	Circular	1.00
LT20706-2	T20706	T20640	100	0.015	865.1	865.7	Natural	1.00
LT20706-3	T20706	T21176	516	0.015	865.1	862.1	Natural	1.00
LT20713-1	T20713	T20706	37	0.014	858.8	858.7	Circular	0.75
LT20713-2	T20713	T20706	37	0.015	865.3	865.1	Natural	1.00
LT20714-1	T20714	T20713	182	0.014	860.3	858.8	Circular	0.75
LT20714-2	T20714	T20713	182	0.015	865.3	865.3	Natural	1.00
LT20738-1	T20738	T20568	207	0.014	844.2	843.1	Circular	1.00
LT20738-2	T20738	T20568	207	0.015	848.2	852.4	Natural	1.00
LT20751-1	T20751	T20477	305	0.014	847.0	846.1	Circular	5.50
LT20751-2	T20751	T20477	305	0.015	856.3	857.3	Natural	1.00
LT20761-1	T20761	T20621	315	0.014	865.8	865.0	Circular	1.00
LT20761-2	T20761	T20621	315	0.015	868.3	870.8	Natural	1.00
LT20831-1	T20831	T21293	93	0.014	870.5	869.1	Circular	0.75
LT20831-2	T20831	T21293	93	0.015	874.0	875.5	Natural	1.00
LT21001-1	T21001	T20751	319	0.014	847.9	847.0	Circular	5.50

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LT21001-2	T21001	T20751	319	0.015	855.3	856.3	Natural	1.00
LT21152-1	T21152	T21168	140	0.014	849.3	848.5	Circular	4.00
LT21152-2	T21152	T21168	140	0.015	858.3	855.8	Natural	1.00
LT21168-1	T21168	T21001	29	0.014	848.5	847.9	Circular	4.00
LT21168-2	T21168	T21001	29	0.015	855.8	855.3	Natural	1.00
LT21168-3	T21001	U21230	247	0.015	855.3	849.0	Natural	1.00
LT21175-1	T21175	T21176	37	0.014	854.5	853.8	Special	4.26
LT21175-2	T21175	T21176	37	0.015	862.3	862.1	Natural	1.00
LT21176-1	T21176	T21152	245	0.014	853.8	850.5	Circular	3.50
LT21176-2	T21176	T21152	245	0.015	862.1	858.3	Natural	1.00
LT21199-1	T21199	T21175	91	0.014	856.4	854.5	Circular	3.50
LT21199-2	T21199	T21175	91	0.015	865.3	862.3	Natural	1.00
LT21206-1	T21206	T21199	294	0.014	861.2	856.4	Circular	3.50
LT21206-2	T21206	T21199	294	0.015	871.9	865.3	Natural	1.00
LT21261-1	T21261	T21206	15	0.014	862.3	861.8	Circular	3.50
LT21261-2	T21261	T21206	15	0.015	872.0	871.9	Natural	1.00
LT21262-1	T21262	T21261	36	0.014	865.8	865.1	Circular	3.00
LT21262-2	T21262	T21261	36	0.015	872.1	871.9	Natural	1.00
LT21280-1	T21280	T21262	298	0.014	867.2	866.1	Circular	3.00
LT21280-2	T21280	T21262	298	0.015	873.8	872.1	Natural	1.00
LT21281-1	T21281	T21280	43	0.014	867.4	867.2	Circular	3.00
LT21281-2	T21281	T21280	43	0.015	872.9	873.8	Natural	1.00
LT21283-3	T21281	T20483	670	0.015	872.9	870.6	Natural	1.00
LT21290-1	T21290	T21291	35	0.014	868.4	868.4	Circular	2.75
LT21290-2	T21290	T21291	35	0.015	874.8	874.7	Natural	1.00
LT21291-1	T21291	T21281	300	0.014	868.4	867.4	Circular	2.75
LT21291-2	T21291	T21281	300	0.015	874.7	872.9	Natural	1.00
LT21293-1	T21293	T21290	147	0.014	868.9	868.4	Circular	2.50
LT21293-2	T21293	T21290	147	0.015	875.5	874.8	Natural	1.00
LT21296-1	T21296	T21300	248	0.014	886.0	879.5	Circular	1.00
LT21296-2	T21296	T21300	248	0.015	893.3	884.3	Natural	1.00
LT21298-1	T21298	T21299	36	0.014	879.0	878.7	Circular	1.50
LT21298-2	T21298	T21299	36	0.015	883.6	883.3	Natural	1.00
LT21299-1	T21299	T21311	146	0.014	878.4	877.4	Circular	1.50
LT21299-2	T21299	T21311	146	0.015	883.3	883.0	Natural	1.00
LT21299-3	T21299	T20531	667	0.015	883.3	875.8	Natural	1.00
LT21300-1	T21300	T21298	42	0.014	879.5	879.0	Circular	1.00
LT21300-2	T21300	T21298	42	0.015	884.3	883.6	Natural	1.00
LT21305-1	T21305	T21293	148	0.014	869.5	868.9	Circular	2.50
LT21305-2	T21305	T21293	148	0.015	876.3	875.5	Natural	1.00
LT21308-1	T21308	T21305	27	0.014	869.5	869.5	Circular	2.50
LT21308-2	T21308	T21305	27	0.015	876.5	876.3	Natural	1.00
LT21311-1	T21311	T21322	124	0.014	877.4	876.9	Circular	1.50
LT21311-2	T21311	T21322	124	0.015	883.0	882.8	Natural	1.00
LT21320-1	T21320	T21308	322	0.014	874.5	870.6	Circular	1.75
LT21320-2	T21320	T21308	322	0.015	883.2	876.5	Natural	1.00
LT21320-3	T21320	T20511	674	0.015	883.2	874.8	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LT21322-1	T21322	T21320	48	0.014	876.9	876.5	Circular	1.50
LT21322-2	T21322	T21320	48	0.015	882.8	883.2	Natural	1.00
LT21359-1	T21359	T21261	36	0.014	863.5	862.3	Circular	3.50
LT21359-2	T21359	T21261	36	0.015	871.8	871.9	Natural	1.00
LT21439-1	T21439	T21359	349	0.014	868.0	864.6	Circular	3.50
LT21439-2	T21439	T21359	349	0.015	877.3	871.8	Natural	1.00
LT21890-1	T21890	T21439	258	0.014	868.6	868.0	Circular	3.50
LT21890-2	T21890	T21439	258	0.015	878.3	877.3	Natural	1.00
LT22070-1	T22070	T22072	56	0.014	871.6	871.5	Circular	2.50
LT22070-2	T22070	T22072	56	0.015	877.3	877.3	Natural	1.00
LT22072-1	T22072	T21890	304	0.014	871.5	870.5	Circular	2.50
LT22072-2	T22072	T21890	304	0.015	877.3	878.3	Natural	1.00
LT22077-1	T22077	T22070	333	0.014	878.2	871.6	Circular	1.50
LT22077-2	T22077	T22070	333	0.015	884.3	877.3	Natural	1.00
LT22077-3	T22077	42_HA	655	0.015	884.3	880.1	Natural	1.00
LT22082-1	T22082	T22077	322	0.014	880.9	878.2	Circular	1.50
LT22082-2	T22082	T22077	322	0.015	887.3	884.3	Natural	1.00
LT22082-3	T22082	T21305	666	0.015	887.3	876.3	Natural	1.00
LT22083-1	T22083	T22082	306	0.014	884.2	881.6	Circular	1.00
LT22083-2	T22083	T22082	306	0.015	890.3	887.3	Natural	1.00
LT22083-3	T22083	T21320	666	0.015	890.3	883.2	Natural	1.00
LT22087-1	T22087	T22083	54	0.014	884.4	884.2	Circular	1.00
LT22087-2	T22087	T22083	54	0.015	890.3	890.3	Natural	1.00
LT22090-1	T22090	T22087	321	0.014	886.3	884.4	Circular	1.00
LT22090-2	T22090	T22087	321	0.015	891.3	890.3	Natural	1.00
LT22090-3	T22090	T21299	674	0.015	891.3	883.3	Natural	1.00
LT22096-1	T22096	T21890	41	0.014	868.7	868.6	Circular	3.50
LT22096-2	T22096	T21890	41	0.015	878.3	878.3	Natural	1.00
LT22233	T22233	T22846	180	0.014	878.8	877.8	Circular	0.75
LT22263	T22263	T22820.1	109	0.013	871.3	870.5	Circular	1.00
LT22683-1	T22683	T22096	623	0.014	869.8	868.7	Circular	3.50
LT22683-2	T22683	T22096	623	0.015	879.3	878.3	Natural	1.00
LT22803-1	T22803	T22683	180	0.014	870.1	869.8	Circular	3.50
LT22803-2	T22803	T22683	180	0.015	878.8	879.3	Natural	1.00
LT22808-1	T22808	T22803	119	0.014	870.3	870.1	Circular	3.50
LT22808-2	T22808	T22803	119	0.015	878.3	878.8	Natural	1.00
LT22811-1	T22812	T22808	78	0.014	870.4	870.3	Circular	3.00
LT22811-2	T22812	T22808	78	0.015	878.3	878.3	Natural	1.00
LT22812-3	T22812	T22072	658	0.015	878.3	877.3	Natural	1.00
LT22820-1	T22820	T22820.1	163	0.014	870.7	870.5	Circular	3.50
LT22820-1.	T22820.1	T22812	106	0.014	870.5	870.4	Circular	3.50
LT22820-2	T22820	T22820.1	163	0.016	879.3	878.7	Natural	1.00
LT22820-2.	T22820.1	T22812	106	0.016	878.7	878.3	Natural	1.00
LT22824-1	T22824	T22820	44	0.014	873.3	873.0	Circular	1.00
LT22824-2	T22824	T22820	44	0.015	880.1	879.3	Natural	1.00
LT22846-1	T22846	T22824	136	0.014	877.8	873.3	Circular	0.75
LT22846-2	T22846	T22824	136	0.015	885.8	880.1	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LT22892-1	T22892	T22820	35	0.014	871.0	870.7	Circular	3.00
LT22892-2	T22892	T22820	35	0.015	879.3	879.3	Natural	1.00
LT22929-1	T22929	T22803	145	0.014	871.3	870.4	Circular	0.75
LT22929-2	T22929	T22803	145	0.015	875.4	878.8	Natural	1.00
LT22962-1	T22962	T22929	165	0.014	872.3	871.3	Circular	0.75
LT22962-2	T22962	T22929	165	0.015	875.3	875.4	Natural	1.00
LT23434-1	T23434	T22892	608	0.014	871.8	871.0	Circular	3.00
LT23434-2	T23434	T22892	608	0.015	879.3	879.3	Natural	1.00
LT23544-1	T23544	T23434	152	0.014	872.0	871.8	Circular	1.50
LT23544-2	T23544	T23434	152	0.015	878.3	879.3	Natural	1.00
LT23563-1	T23563	T23565	41	0.014	872.6	872.2	Circular	1.00
LT23563-2	T23563	T23565	41	0.015	877.3	877.3	Natural	1.00
LT23563-3	T23563	U23539	337	0.015	877.3	870.3	Natural	1.00
LT23565-1	T23565	N510	129	0.014	872.2	872.0	Circular	1.50
LT23565-2	T23565	N510	129	0.016	877.3	878.3	Natural	1.00
LT23647-1	T23647	T23434	72	0.014	874.2	872.5	Circular	2.00
LT23647-2	T23647	T23434	72	0.015	879.3	879.3	Natural	1.00
LT23752-1	T23752	T23647	281	0.014	874.8	874.2	Circular	1.75
LT23752-2	T23752	T23647	281	0.015	881.3	879.3	Natural	1.00
LT24284-1	T24284	T24297	116	0.014	877.5	876.6	Circular	1.00
LT24284-2	T24284	T24297	116	0.015	882.3	881.3	Natural	1.00
LT24287-1	T24287	T24284	170	0.014	877.5	877.5	Circular	1.00
LT24287-2	T24287	T24284	170	0.015	883.1	882.3	Natural	1.00
LT24297-1	T24297	T24331	73	0.014	876.6	876.2	Circular	1.00
LT24297-2	T24297	T24331	73	0.015	881.3	881.3	Natural	1.00
LT24297-3	T24297	T23563	663	0.015	881.3	877.3	Natural	1.00
LT24301-1	T24301	T24261	26	0.014	159.8	159.8	Circular	1.00
LT24301-2	T24301	T24261	10	0.015	0.1	0.0	Natural	1.00
LT24319-1	T24319	T24287	23	0.014	878.1	877.5	Circular	0.67
LT24319-2	T24319	T24287	23	0.015	883.3	883.1	Natural	1.00
LT24331-1	T24331	T24339	268	0.014	876.2	875.7	Circular	1.75
LT24331-2	T24331	T24339	268	0.015	881.3	886.3	Natural	1.00
LT24339-1	T24339	T23752	347	0.014	875.7	874.8	Circular	1.75
LT24339-2	T24339	T23752	347	0.015	886.3	881.3	Natural	1.00
LT99991	T99991	T99992	367	0.014	843.6	842.5	Circular	1.50
LT99992	T99992	T20405	488	0.014	842.5	841.1	Circular	2.00
LU1471	U23501	U99998	15	0.014	857.5	857.5	Circular	1.75
LU1471-3	U23501	U99998	15	0.015	864.5	864.3	Natural	1.00
LU1474	U23597	U99998	28	0.014	860.3	860.2	Circular	1.50
LU1573	U99997	U23501	10	0.014	857.3	857.8	Circular	1.00
LU20747-1	U20747	U20790	202	0.014	840.5	839.5	Circular	1.00
LU20747-2	U20747	U20790	202	0.015	845.0	844.2	Natural	1.00
LU20790-1	U20790	U20984	133	0.014	836.5	835.9	Circular	1.25
LU20790-2	U20790	U20984	133	0.015	844.2	843.8	Natural	1.00
LU20795-1	U20795	U21117	107	0.014	834.8	834.3	Circular	0.75
LU20795-2	U20795	U21117	107	0.015	840.5	841.4	Natural	0.80
LU20984-1	U20984	U21122	28	0.014	835.9	835.5	Circular	1.25

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU20984-2	U20984	U21122	28	0.015	843.8	843.5	Natural	1.00
LU21092-1	U21092	40TH	150	0.014	825.5	824.3	Circular	3.00
LU21092-2	U21092	40TH	150	0.015	847.8	832.2	Natural	1.00
LU21117-1	U21117	U21149	166	0.014	833.6	832.8	Circular	2.50
LU21117-2	U21117	U21149	166	0.015	841.3	839.3	Natural	1.00
LU21122-1	U21122	U21117	141	0.014	834.4	833.7	Circular	2.50
LU21122-2	U21122	U21117	141	0.015	843.4	841.3	Natural	1.00
LU21136-1	U21136	U21145	281	0.014	832.1	830.2	Circular	3.00
LU21136-2	U21136	U21145	281	0.015	839.8	846.8	Natural	1.00
LU21145-1	U21145	U21092	47	0.014	830.2	829.8	Circular	3.00
LU21145-2	U21145	U21092	47	0.015	846.8	847.8	Natural	1.00
LU21149-1	U21149	U21136	26	0.014	832.3	832.1	Circular	3.00
LU21149-2	U21149	U21136	26	0.015	839.3	839.8	Natural	1.00
LU21149-4	U21149	U22569	1348	0.015	839.3	838.8	Natural	1.00
LU21211-1	U21211	U21122	25	0.014	834.6	834.5	Special	1.50
LU21211-2	U21211	U21122	25	0.015	843.5	843.4	Natural	1.00
LU21226-1	U21226	U21211	38	0.014	838.1	837.7	Circular	1.50
LU21226-2	U21226	U21211	38	0.015	843.6	843.5	Natural	1.00
LU21230-1	U21230	U21226	218	0.014	841.5	839.3	Circular	1.50
LU21230-2	U21230	U21226	218	0.015	849.0	843.6	Natural	1.00
LU21428-1	U21428	U21211	357	0.014	840.3	838.3	Circular	1.50
LU21428-2	U21428	U21211	357	0.015	847.4	843.7	Natural	1.00
LU21729-1	U21729	U21428	277	0.014	841.5	840.3	Circular	1.50
LU21729-2	U21729	U21428	277	0.015	849.5	847.4	Natural	1.00
LU21809-1	U21809	U22187	335	0.014	840.4	839.1	Circular	1.50
LU21809-2	U21809	U22187	335	0.015	849.0	845.9	Natural	1.00
LU21866-1	U21866	U21809	156	0.014	841.3	840.6	Circular	0.75
LU21866-2	U21866	U21809	156	0.015	850.5	849.0	Natural	1.00
LU21949-1	U21949	U21729	59	0.014	843.3	843.0	Circular	1.50
LU21949-2	U21949	U21729	59	0.015	850.2	849.5	Natural	1.00
LU21973-1	U21973	U21949	300	0.014	862.5	845.8	Circular	1.00
LU21973-2	U21973	U21949	300	0.015	869.3	850.2	Natural	1.00
LU21973-3	U21973	U21230	663	0.015	869.3	849.0	Natural	1.00
LU22005-1	U22005	U21973	349	0.014	878.2	862.5	Circular	1.00
LU22005-2	U22005	U21973	349	0.015	882.3	869.3	Natural	1.00
LU22005-3	U22005	U22749	660	0.015	882.3	876.3	Natural	1.00
LU22150-1	U22150	U21866	145	0.014	843.0	841.3	Circular	0.75
LU22150-2	U22150	U21866	145	0.015	851.2	850.5	Natural	1.00
LU22187-1	U22187	U22413	298	0.014	839.1	838.0	Circular	1.50
LU22187-2	U22187	U22413	298	0.015	845.9	843.8	Natural	1.00
LU22192-1	U22192	U22150	197	0.014	843.8	843.0	Circular	0.75
LU22192-2	U22192	U22150	197	0.015	847.8	851.2	Natural	1.00
LU22413-1	U22413	42ND	146	0.014	838.0	814.3	Circular	3.00
LU22413-2	U22413	42ND	146	0.015	843.8	821.5	Natural	1.00
LU22439-1	U22485	42ND	152	0.014	832.1	814.3	Circular	1.75
LU22439-2	U22485	42ND	152	0.015	839.1	821.5	Natural	1.00
LU22511-1	U22511	U22413	37	0.014	838.3	838.1	Circular	2.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU22511-2	U22511	U22413	37	0.015	844.3	843.8	Natural	1.00
LU22515-1	U22515	U22530	160	0.014	844.3	841.2	Circular	1.25
LU22515-2	U22515	U22530	160	0.015	850.3	847.3	Natural	1.00
LU22530-1	U22530	U22511	148	0.014	841.2	838.3	Circular	1.25
LU22530-2	U22530	U22511	148	0.015	847.3	844.3	Natural	1.00
LU22569-1	U22569	U22485	61	0.014	832.6	832.3	Circular	1.25
LU22569-2	U22569	U22485	61	0.015	838.8	838.6	Natural	1.00
LU22577-1	U22577	U22569	149	0.014	833.4	832.6	Circular	1.25
LU22577-2	U22577	U22569	149	0.015	839.3	838.8	Natural	1.00
LU22580-1	U22580	U22587	184	0.014	844.9	835.7	Circular	1.00
LU22580-2	U22580	U22587	184	0.015	853.2	840.3	Natural	1.00
LU22587-1	U22587	U22577	151	0.014	834.3	833.4	Circular	1.25
LU22587-2	U22587	U22577	151	0.015	840.3	839.3	Natural	1.00
LU22606-1	U22606	U22580	182	0.014	857.0	848.0	Circular	1.00
LU22606-2	U22606	U22580	182	0.015	864.3	853.2	Natural	1.00
LU22606-3	U22606	U23453	667	0.015	864.3	859.3	Natural	1.00
LU22634-1	U22634	U22941	232	0.014	866.8	863.5	Circular	1.25
LU22634-2	U22634	U22941	232	0.015	873.8	870.3	Natural	1.00
LU22749-1	U22749	U22634	317	0.014	871.2	869.1	Circular	1.00
LU22749-2	U22749	U22634	317	0.015	876.3	873.8	Natural	1.00
LU22749-3	U22749	U23502	658	0.015	876.3	864.3	Natural	1.00
LU22817-1	U22817	U22936	184	0.014	867.3	860.8	Circular	1.25
LU22817-2	U22817	U22936	184	0.015	873.8	866.3	Natural	1.00
LU22936-1	U22936	U22980	213	0.014	860.8	860.4	Circular	1.25
LU22936-2	U22936	U22980	213	0.015	866.3	865.8	Natural	1.00
LU22941-1	U22941	U22986	220	0.014	863.5	860.4	Circular	1.25
LU22941-2	U22941	U22986	220	0.015	870.3	866.3	Natural	1.00
LU22942-1	U22942	U22990	256	0.014	865.3	863.8	Circular	0.75
LU22942-2	U22942	U22990	256	0.015	869.6	868.9	Natural	1.00
LU22980-1	U22980	U23526	256	0.014	860.4	860.0	Circular	1.25
LU22980-2	U22980	U23526	256	0.015	865.8	865.3	Natural	1.00
LU22986-1	U22986	U23480	213	0.014	860.4	857.3	Circular	1.25
LU22986-2	U22986	U23480	213	0.015	866.3	863.3	Natural	1.00
LU22990-1	U22990	U23468	186	0.014	863.8	856.3	Circular	0.75
LU22990-2	U22990	U23468	186	0.015	868.9	861.3	Natural	1.00
LU22992-1	U22992	U23533	177	0.014	861.7	861.2	Circular	1.25
LU22992-2	U22992	U23533	172	0.016	864.1	868.3	Natural	0.50
LU23200	U23200	43RD_ORIF	64	0.014	814.7	814.1	Circular	4.00
LU23424-1	U23424	U23200	32	0.014	830.0	829.4	Circular	2.00
LU23424-2	U23424	U23200	32	0.015	840.3	838.3	Natural	1.00
LU23429-1	U23429	U23424	32	0.014	834.3	833.8	Circular	2.00
LU23429-2	U23429	U23424	32	0.015	840.3	840.3	Natural	1.00
LU23436-1	U23436	U23429	157	0.014	837.3	834.3	Circular	2.00
LU23436-2	U23436	U23429	157	0.015	844.8	840.3	Natural	1.00
LU23442-1	U23442-1	U23436	178	0.014	840.3	837.3	Circular	2.00
LU23442-2	U23442-1	U23436	178	0.015	849.3	844.8	Natural	1.00
LU23442-3	U23442-1	U22587	666	0.015	849.3	840.3	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU23445-1	U23445	U23442-1	143	0.014	847.3	840.3	Circular	2.00
LU23445-2	U23445	U23442-1	143	0.015	854.3	849.3	Natural	1.00
LU23449-1	U23449	U23450	9	0.014	850.9	850.8	Circular	2.00
LU23449-2	U23449	U23450	9	0.015	859.3	859.3	Natural	1.00
LU23450-1	U23450	U23445	133	0.014	850.8	847.3	Circular	2.00
LU23450-2	U23450	U23445	133	0.015	859.3	854.3	Natural	1.00
LU23453-1	U23453	U23449	22	0.014	851.3	850.9	Circular	2.00
LU23453-2	U23453	U23449	22	0.015	859.3	859.3	Natural	1.00
LU23453-3	U23453	U24190	659	0.015	859.3	854.8	Natural	1.00
LU23456-1	U23456	U23453	30	0.014	852.3	851.3	Circular	2.00
LU23456-2	U23456	U23453	30	0.015	859.3	859.3	Natural	1.00
LU23458-1	U23458	U23456	26	0.014	852.8	852.3	Circular	2.00
LU23458-2	U23458	U23456	26	0.015	859.8	859.3	Natural	1.00
LU23468-1	U23468	U23458	127	0.014	854.1	852.8	Circular	2.00
LU23468-2	U23468	U23458	127	0.015	861.3	859.8	Natural	1.00
LU23480-1	U23480	U23468	168	0.014	854.7	854.1	Circular	2.00
LU23480-2	U23480	U23468	168	0.015	863.3	861.3	Natural	1.00
LU23480-3	U23480	U24206-1	658	0.015	863.3	858.3	Natural	1.00
LU23482-1	U23482	U23480	18	0.014	854.8	854.7	Circular	2.00
LU23482-2	U23482	U23480	18	0.015	863.4	863.3	Natural	1.00
LU23496-1	U23496	U23482	143	0.014	855.9	854.8	Circular	1.75
LU23496-2	U23496	U23482	143	0.015	863.8	863.3	Natural	1.00
LU23501-1	U99998	U23496	165	0.014	857.5	855.9	Circular	1.75
LU23501-2	U99998	U23496	165	0.015	864.3	863.8	Natural	1.00
LU23502-1	U23502	U23501	26	0.014	857.8	857.5	Circular	1.75
LU23502-2	U23502	U23501	26	0.015	864.6	864.5	Natural	1.00
LU23512-1	U23512	U23502	104	0.014	858.6	857.8	Circular	1.75
LU23512-2	U23512	U23502	104	0.015	864.7	864.6	Natural	1.00
LU23515-1	U23515	U23512	38	0.014	858.8	858.6	Circular	1.75
LU23515-2	U23515	U23512	38	0.015	864.8	864.7	Natural	1.00
LU23526-1	U23526	U23515	159	0.014	860.0	858.8	Circular	1.75
LU23526-2	U23526	U23515	159	0.015	865.3	864.8	Natural	1.00
LU23527-1	U23527	U23526	32	0.014	860.0	860.0	Circular	1.25
LU23527-2	U23527	U23526	32	0.015	865.3	865.3	Natural	1.00
LU23533-1	U23533	U23527	143	0.014	861.2	860.0	Circular	1.25
LU23533-2	U23533	U23527	143	0.015	867.8	865.3	Natural	1.00
LU23537-1	U23537	U23533	122	0.014	862.3	861.2	Circular	1.25
LU23537-2	U23537	U23533	122	0.015	869.3	867.8	Natural	1.00
LU23539-1	U23539	U23537	50	0.014	863.3	862.3	Circular	1.25
LU23539-2	U23539	U23537	50	0.015	870.3	869.3	Natural	1.00
LU23597-1	U23597	U99997	18	0.014	858.3	857.3	Circular	1.50
LU23597-2	U23597	U99997	18	0.015	864.6	864.6	Natural	1.00
LU23733-1	U23733-1	U23597	286	0.014	859.8	858.3	Circular	1.50
LU23733-2	U23733-1	U23597	286	0.015	862.1	864.6	Natural	1.00
LU23784-1	U23765	U23819	114	0.014	842.3	857.6	Circular	1.00
LU23784-2	U23765	U23819	114	0.015	851.3	864.8	Natural	1.00
LU23790-1	U23790	U24078	150	0.014	849.3	848.3	Circular	0.75

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU23790-2	U23790	U24078	150	0.015	854.3	854.4	Natural	1.00
LU23819-1	U23819	U24098	80	0.014	857.6	857.2	Circular	0.75
LU23819-2	U23819	U24098	80	0.015	864.8	864.3	Natural	1.00
LU23888	U23888	44TH_ORIF	68	0.014	816.6	816.0	Circular	4.00
LU24078-1	U24078	U24145	11	0.014	848.3	848.2	Circular	1.00
LU24078-2	U24078	U24145	11	0.015	854.4	854.6	Natural	1.00
LU24098-1	U24098	U24220	21	0.014	857.2	857.1	Circular	0.75
LU24098-2	U24098	U24220	21	0.015	864.3	863.9	Natural	1.00
LU24127-1	U24127	U23888	85	0.014	845.3	825.0	Circular	1.75
LU24127-2	U24127	U23888	85	0.015	854.3	831.7	Natural	1.00
LU24145-1	U24145	U24127	176	0.014	845.8	845.3	Circular	1.75
LU24145-2	U24145	U24127	176	0.015	854.6	854.3	Natural	1.00
LU24159-1	U24159	U24145	136	0.014	846.1	845.8	Circular	1.75
LU24159-2	U24159	U24145	136	0.015	854.8	854.6	Natural	1.00
LU24161-1	U24161	U24159	25	0.014	846.2	846.1	Circular	1.50
LU24161-2	U24161	U24159	25	0.015	854.8	854.7	Natural	1.00
LU24164-1	U24164	U24165	19	0.014	847.0	847.0	Circular	1.50
LU24164-2	U24164	U24165	19	0.015	854.9	854.8	Natural	1.00
LU24165-1	U24165	U24161	23	0.014	847.0	846.2	Circular	1.50
LU24165-2	U24165	U24161	23	0.015	854.8	854.7	Natural	1.00
LU24165-3	U24165	U24793	660	0.015	854.8	846.3	Natural	1.00
LU24176-1	U24176	U24164	124	0.014	847.3	847.0	Circular	1.50
LU24176-2	U24176	U24164	124	0.015	854.9	854.9	Natural	1.00
LU24190-1	U24190	U24176	164	0.014	847.7	847.3	Circular	1.50
LU24190-2	U24190	U24176	164	0.015	854.8	854.8	Natural	1.00
LU24190-3	U24190	U24812	660	0.015	854.8	853.3	Natural	0.50
LU24191-1	U24191	U24190	55	0.014	847.9	847.7	Circular	1.25
LU24191-2	U24191	U24190	55	0.015	855.1	854.8	Natural	1.00
LU24201-1	U24201	U24191	124	0.014	848.8	847.9	Circular	1.25
LU24201-2	U24201	U24191	124	0.015	855.3	855.1	Natural	1.00
LU24206-1	U24206-1	U24201	155	0.014	851.3	848.8	Circular	1.25
LU24206-2	U24206-1	U24201	155	0.015	858.3	855.3	Natural	1.00
LU24211-1	U24211	U24206-1	35	0.014	852.3	851.3	Circular	1.25
LU24211-2	U24211	U24206-1	35	0.015	858.3	858.3	Natural	1.00
LU24220-1	U24220	U24211	143	0.014	856.8	852.3	Circular	1.00
LU24220-2	U24220	U24211	143	0.015	863.9	858.3	Natural	1.00
LU24237-1	U24237	U24220	179	0.014	862.1	856.8	Circular	1.00
LU24237-2	U24237	U24220	179	0.015	868.3	863.9	Natural	1.00
LU24252-1	U24252	U24237	315	0.014	880.4	862.1	Circular	1.00
LU24252-2	U24252	U24237	315	0.015	888.3	868.3	Natural	1.00
LU24254-1	U24254	U24252	35	0.014	881.1	880.4	Circular	1.00
LU24254-2	U24254	U24252	35	0.015	888.3	888.3	Natural	1.00
LU24461-1	U24461	U24515	205	0.014	872.6	871.8	Circular	1.00
LU24461-2	U24461	U24515	205	0.015	877.5	876.8	Natural	1.00
LU24515-1	U24515	U24876	206	0.014	871.8	870.8	Circular	1.00
LU24515-2	U24515	U24876	206	0.015	876.8	876.3	Natural	1.00
LU24771	U24771	45TH_ORIF	52	0.014	818.5	818.0	Circular	4.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU24775-1	U24775	U24779	13	0.014	839.4	839.4	Circular	2.00
LU24775-2	U24775	U24779	13	0.015	852.3	852.3	Natural	1.00
LU24779-1	U24779	U24771	34	0.014	839.4	839.3	Circular	2.00
LU24779-2	U24779	U24771	34	0.015	852.3	852.4	Natural	1.00
LU24784-1	U24784	U24775	163	0.014	839.8	839.4	Circular	2.00
LU24784-2	U24784	U24775	163	0.015	847.3	852.3	Natural	1.00
LU24793-1	U24793	U24864	10	0.014	840.3	838.7	Circular	2.00
LU24793-2	U24793	U24864	10	0.015	846.3	846.4	Natural	1.00
LU24794-1	U24794	U24793	30	0.014	840.8	840.3	Circular	1.50
LU24794-2	U24794	U24793	30	0.015	846.8	846.3	Natural	1.00
LU24797-1	U24797	U24794	136	0.014	842.8	840.8	Circular	1.50
LU24797-2	U24797	U24794	136	0.015	849.8	846.8	Natural	1.00
LU24805-1	U24805	U24797	136	0.014	844.9	842.8	Circular	1.50
LU24805-2	U24805	U24797	136	0.015	853.3	849.8	Natural	1.00
LU24811-1	U24811	U24805	27	0.014	845.3	844.9	Circular	1.50
LU24811-2	U24811	U24805	27	0.015	853.3	853.3	Natural	1.00
LU24812-1	U24812	U24811	9	0.014	845.5	845.3	Circular	1.33
LU24812-2	U24812	U24811	9	0.015	853.3	853.3	Natural	1.00
LU24816-1	U24816	U24812	25	0.014	846.1	845.5	Circular	1.33
LU24816-2	U24816	U24812	25	0.015	853.3	853.3	Natural	1.00
LU24817-1	U24817	U24816	8	0.014	846.7	846.1	Circular	1.33
LU24817-2	U24817	U24816	8	0.015	853.3	853.3	Natural	1.00
LU24819-1	U24819	U24817	13	0.014	846.8	846.7	Circular	1.33
LU24819-2	U24819	U24817	13	0.015	854.3	853.3	Natural	1.00
LU24824-1	U24824	U24819	130	0.014	849.6	846.8	Circular	1.00
LU24824-2	U24824	U24819	130	0.015	856.8	854.3	Natural	1.00
LU24837-1	U24837	U24824	175	0.014	853.3	849.6	Circular	1.00
LU24837-2	U24837	U24824	175	0.015	860.3	856.8	Natural	1.00
LU24845-1	U24845	U24771	40	0.014	836.5	833.9	Circular	2.00
LU24845-2	U24845	U24771	40	0.015	852.3	852.4	Natural	1.00
LU24856-1	U24856	U24845	166	0.014	837.9	837.2	Circular	2.00
LU24856-2	U24856	U24845	166	0.015	847.3	852.3	Natural	1.00
LU24864-1	U24864	U24856	159	0.014	838.7	837.9	Circular	2.00
LU24864-2	U24864	U24856	159	0.015	846.3	847.3	Natural	1.00
LU24869-1	U24869	U24874	142	0.014	876.3	870.3	Circular	1.00
LU24869-2	U24869	U24874	142	0.015	884.8	876.3	Natural	1.00
LU24871-1	U24871	U24875	147	0.014	869.8	869.3	Circular	1.75
LU24871-2	U24871	U24875	147	0.015	875.8	875.3	Natural	1.00
LU24874-1	U24874	U24908	22	0.014	870.3	869.3	Circular	1.00
LU24874-2	U24874	U24908	22	0.015	876.3	875.3	Natural	1.00
LU24875-1	U24875	U24908	22	0.014	869.3	869.3	Circular	1.75
LU24875-2	U24875	U24908	22	0.015	875.3	875.2	Natural	1.00
LU24876-1	U24876	U24871	165	0.014	870.3	869.8	Circular	1.75
LU24876-2	U24876	U24871	165	0.015	876.3	875.8	Natural	1.00
LU24878-1	U24878	U24876	30	0.014	870.4	870.3	Circular	1.50
LU24878-2	U24878	U24876	30	0.015	876.3	876.3	Natural	1.00
LU24884-1	U24884	U24935	28	0.014	870.4	870.2	Circular	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU24884-2	U24884	U24935	28	0.015	874.3	874.3	Natural	1.00
LU24885-1	U24885	U24878	156	0.014	870.8	870.4	Circular	1.50
LU24885-2	U24885	U24878	156	0.015	877.3	876.3	Natural	1.00
LU24889-1	U24889	U24885	149	0.014	871.2	870.8	Circular	1.50
LU24889-2	U24889	U24885	149	0.015	878.3	877.3	Natural	1.00
LU24890-1	U24890	U24869	142	0.014	877.3	876.3	Circular	1.00
LU24890-2	U24890	U24869	142	0.015	883.6	884.8	Natural	1.00
LU24891-1	U24891	U24889	36	0.014	871.8	871.2	Circular	1.00
LU24891-2	U24891	U24889	36	0.015	878.3	878.3	Natural	1.00
LU24897-1	U24897	U24891	148	0.014	872.5	871.8	Circular	1.00
LU24897-2	U24897	U24891	148	0.015	879.3	878.3	Natural	1.00
LU24901-1	U24901	U24897	154	0.014	873.3	872.5	Circular	1.00
LU24901-2	U24901	U24897	154	0.015	880.3	879.3	Natural	1.00
LU24901-3	U24901	U24884	350	0.015	880.3	874.3	Natural	1.00
LU24908-1	U24908	U24971	189	0.014	869.3	868.5	Circular	2.00
LU24908-2	U24908	U24971	189	0.015	875.7	875.6	Natural	1.00
LU24917	U24917	U24871	22	0.014	869.9	869.8	Circular	1.00
LU24935-1	U24935	U24985	332	0.014	869.5	868.5	Circular	1.00
LU24935-2	U24935	U24985	332	0.015	874.3	873.8	Natural	1.00
LU24966	U24966	U24917	129	0.014	870.5	869.9	Circular	1.00
LU24971-1	U24971	U24978	69	0.014	868.5	868.3	Circular	2.00
LU24971-2	U24971	U24978	69	0.015	875.6	875.5	Natural	1.00
LU24978-1	U24978	U25000	125	0.014	868.3	867.8	Circular	2.00
LU24978-2	U24978	U25000	125	0.015	875.5	874.4	Natural	1.00
LU24985-1	U24985	U25437	332	0.014	868.5	867.5	Circular	1.00
LU24985-2	U24985	U25437	332	0.015	873.8	873.3	Natural	1.00
LU24987-1	U24987	U25000	176	0.014	869.3	867.8	Circular	0.75
LU24987-2	U24987	U25000	176	0.015	873.3	875.2	Natural	1.00
LU24988-1	U24988	U24837	389	0.014	861.3	854.2	Circular	1.00
LU24988-2	U24988	U24837	389	0.015	868.2	860.3	Natural	1.00
LU25000-1	U25000	U25237	233	0.014	867.8	867.3	Circular	2.00
LU25000-2	U25000	U25237	233	0.015	874.4	874.3	Natural	1.00
LU25002-1	U25002	U24988	182	0.014	869.3	862.3	Circular	0.75
LU25002-2	U25002	U24988	182	0.015	874.3	868.2	Natural	1.00
LU25237-1	U25237	U25327	20	0.014	867.3	867.3	Circular	2.00
LU25237-2	U25237	U25327	20	0.015	874.4	874.3	Natural	1.00
LU25262	U25262	B5564	65	0.014	820.3	819.7	Circular	2.25
LU25273-1	U25273	U25262	145	0.014	853.7	853.3	Circular	2.25
LU25273-2	U25273	U25262	145	0.015	860.8	859.3	Natural	1.00
LU25286-1	U25286	U25273	166	0.014	854.2	853.7	Circular	2.25
LU25286-2	U25286	U25273	166	0.015	862.3	860.8	Natural	1.00
LU25290-1	U25290	U25286	22	0.014	855.3	854.2	Circular	2.25
LU25290-2	U25290	U25286	22	0.015	862.3	862.3	Natural	1.00
LU25290-3	U25290	U24793	659	0.015	862.3	846.3	Natural	1.00
LU25296-1	U25296	U25290	139	0.014	856.9	855.3	Circular	2.00
LU25296-2	U25296	U25290	139	0.015	864.8	862.3	Natural	1.00
LU25299-1	U25301	U25296	159	0.014	858.8	856.9	Circular	2.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU25299-2	U25301	U25296	159	0.015	867.7	864.8	Natural	1.00
LU25301-3	U25301	U25888	656	0.015	867.7	865.3	Natural	1.00
LU25303-1	U25303	U25301	33	0.014	860.6	858.8	Circular	2.00
LU25303-2	U25303	U25301	33	0.015	867.8	867.7	Natural	1.00
LU25304-1	U25304	U25303	21	0.014	860.8	860.6	Circular	2.00
LU25304-2	U25304	U25303	21	0.015	868.3	867.8	Natural	1.00
LU25310-1	U25310	U25304	131	0.014	862.4	860.8	Circular	2.00
LU25310-2	U25310	U25304	131	0.015	869.3	868.3	Natural	1.00
LU25313-1	U25313	U25310	85	0.014	863.5	862.4	Circular	2.00
LU25313-2	U25313	U25310	85	0.015	871.3	869.3	Natural	1.00
LU25314-1	U25314	U25313	69	0.014	863.7	863.5	Circular	2.00
LU25314-2	U25314	U25313	69	0.015	871.8	871.3	Natural	1.00
LU25314-3	U25314	U25936	660	0.015	871.8	866.3	Natural	1.00
LU25315-1	U25315	U25330	146	0.014	866.9	866.5	Circular	2.00
LU25315-2	U25315	U25330	146	0.015	873.8	873.3	Natural	1.00
LU25316-1	U25316	U25314	44	0.014	865.5	863.7	Circular	2.00
LU25316-2	U25316	U25314	44	0.015	872.8	871.8	Natural	1.00
LU25327-1	U25327	U25315	156	0.014	867.3	866.9	Circular	2.00
LU25327-2	U25327	U25315	156	0.015	874.3	873.8	Natural	1.00
LU25327-3	U25327	U25965	666	0.015	874.3	868.3	Natural	1.00
LU25330-1	U25330	U25347	96	0.014	866.5	866.2	Circular	2.00
LU25330-2	U25330	U25347	96	0.015	873.3	873.1	Natural	1.00
LU25330-3	U25330	U25955	662	0.015	873.3	867.3	Natural	1.00
LU25333-1	U25333	U25316	131	0.014	865.8	865.5	Circular	2.00
LU25333-2	U25333	U25316	131	0.015	872.8	872.8	Natural	1.00
LU25347-1	U25347	U25333	97	0.014	866.2	865.8	Circular	2.00
LU25347-2	U25347	U25333	97	0.015	873.1	872.8	Natural	1.00
LU25374-1	U25374	U25377	31	0.014	871.7	871.7	Circular	1.00
LU25374-2	U25374	U25377	31	0.015	878.3	878.3	Natural	1.00
LU25377-1	U25377	U25379	37	0.014	871.7	871.3	Circular	1.00
LU25377-2	U25377	U25379	37	0.015	878.3	877.8	Natural	1.00
LU25379-1	U25379	U25385	120	0.014	871.3	870.6	Circular	1.00
LU25379-2	U25379	U25385	120	0.015	877.8	876.3	Natural	1.00
LU25385-1	U25385	U25390	148	0.014	870.6	868.9	Circular	1.00
LU25385-2	U25385	U25390	148	0.015	876.3	874.3	Natural	1.00
LU25390-1	U25390	U25395	189	0.014	868.9	868.3	Circular	1.25
LU25390-2	U25390	U25395	189	0.015	874.3	873.8	Natural	1.00
LU25390-3	U25390	U25991	657	0.015	874.3	871.3	Natural	1.00
LU25395-1	U25395	U25403	140	0.014	868.3	867.9	Circular	1.25
LU25395-2	U25395	U25403	140	0.015	873.8	873.3	Natural	1.00
LU25401-1	U25401	U25437	32	0.014	867.4	867.3	Circular	1.00
LU25401-2	U25401	U25437	32	0.015	873.3	873.3	Natural	1.00
LU25403-1	U25403	U25437	33	0.014	867.9	867.3	Circular	1.25
LU25403-2	U25403	U25437	33	0.015	873.3	873.3	Natural	1.00
LU25405-1	U25405	U25401	136	0.014	867.9	867.4	Circular	1.00
LU25405-2	U25405	U25401	136	0.015	873.5	873.3	Natural	1.00
LU25410-1	U25410	U25405	137	0.014	868.3	867.9	Circular	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU25410-2	U25410	U25405	137	0.015	874.3	873.5	Natural	1.00
LU25437-1	U25437	U25515	232	0.014	867.3	866.6	Circular	1.50
LU25437-2	U25437	U25515	232	0.015	873.3	872.8	Natural	1.00
LU25490-1	U25490	U25527	181	0.014	862.8	861.8	Circular	0.75
LU25490-2	U25490	U25527	181	0.015	867.1	867.5	Natural	1.00
LU25515-1	U25515	U25560	224	0.014	866.6	865.9	Circular	1.50
LU25515-2	U25515	U25560	224	0.015	872.8	872.7	Natural	1.00
LU25527-1	U25527	U25555	158	0.014	861.8	860.8	Circular	0.75
LU25527-2	U25527	U25555	158	0.015	867.5	870.0	Natural	1.00
LU25555-1	U25555	U25921	166	0.014	860.8	859.8	Circular	0.75
LU25555-2	U25555	U25921	166	0.015	870.0	866.0	Natural	1.00
LU25557-1	47_LY ALL	U25560	163	0.014	870.8	868.3	Circular	1.25
LU25557-2	47_LY ALL	U25560	163	0.015	875.5	872.7	Natural	1.00
LU25559-1	U25559	U25984	185	0.014	865.6	864.6	Circular	0.75
LU25559-2	U25559	U25984	185	0.015	870.0	870.8	Natural	1.00
LU25560-1	U25560	U25998	181	0.014	865.9	865.3	Circular	1.50
LU25560-2	U25560	U25998	181	0.015	872.7	872.3	Natural	1.00
LU25857	U25857	47TH_ORIF	31	0.014	823.2	822.9	Circular	6.00
LU25863	U25863	U25857	43	0.014	845.0	844.7	Circular	6.00
LU25880-1	U25880	U25863	145	0.014	850.2	848.3	Circular	3.00
LU25880-2	U25880	U25863	145	0.015	861.8	859.3	Natural	1.00
LU25888-1	U25888	U25893	136	0.014	854.4	853.6	Circular	3.00
LU25888-2	U25888	U25893	136	0.015	865.3	864.8	Natural	1.00
LU25890-1	U25890	U25880	192	0.014	852.8	850.2	Circular	3.00
LU25890-2	U25890	U25880	192	0.015	864.3	861.8	Natural	1.00
LU25893-1	U25893	U25890	139	0.014	853.6	852.8	Circular	3.00
LU25893-2	U25893	U25890	139	0.015	864.8	864.3	Natural	1.00
LU25895-1	U25895	U25888	80	0.014	854.8	854.4	Circular	3.00
LU25895-2	U25895	U25888	80	0.015	865.4	865.3	Natural	1.00
LU25921-1	U25921	U25895	131	0.014	856.1	854.8	Circular	3.00
LU25921-2	U25921	U25895	131	0.015	866.0	865.3	Natural	1.00
LU25934-1	U25934	U25936	32	0.014	857.8	857.5	Circular	3.00
LU25934-2	U25934	U25936	32	0.015	866.4	866.3	Natural	1.00
LU25936-1	U25936	U25921	152	0.014	857.5	856.1	Circular	3.00
LU25936-2	U25936	U25921	152	0.015	866.3	866.0	Natural	1.50
LU25948-1	U25948	U25934	144	0.014	858.3	857.8	Circular	3.00
LU25948-2	U25948	U25934	144	0.015	867.1	866.3	Natural	1.00
LU25955-1	U25955	U25948	191	0.014	858.6	858.3	Circular	3.00
LU25955-2	U25955	U25948	191	0.015	867.3	867.1	Natural	1.00
LU25957-1	U25957	U25955	144	0.014	858.9	858.6	Circular	3.00
LU25957-2	U25957	U25955	144	0.015	868.0	867.3	Natural	1.00
LU25965-1	U25965	U25957	159	0.014	859.4	858.9	Circular	3.00
LU25965-2	U25965	U25957	159	0.016	868.3	868.0	Natural	1.00
LU25967-1	U25967	U25965	30	0.014	859.5	859.4	Circular	3.00
LU25967-2	U25967	U25965	30	0.015	868.4	868.3	Natural	1.00
LU25972-1	U25972	U25967	140	0.014	860.7	859.5	Circular	3.00
LU25972-2	U25972	U25967	140	0.015	868.8	868.3	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU25973-1	U25973	U25972	164	0.014	862.0	860.7	Circular	3.00
LU25973-2	U25973	U25972	164	0.015	869.3	868.8	Natural	1.00
LU25976-1	U25976	U25973	32	0.014	862.4	862.0	Circular	3.00
LU25976-2	U25976	U25973	32	0.015	869.4	869.3	Natural	1.00
LU25980-1	U25980	U25976	148	0.014	862.7	862.4	Circular	3.00
LU25980-2	U25980	U25976	148	0.015	869.8	869.3	Natural	1.00
LU25981-1	U25981	U25980	142	0.014	863.2	862.7	Circular	3.00
LU25981-2	U25981	U25980	142	0.015	870.3	869.8	Natural	1.00
LU25983-1	U25983	U25981	47	0.014	863.3	863.2	Circular	3.00
LU25983-2	U25983	U25981	47	0.015	870.3	870.2	Natural	1.00
LU25984-1	U25984	U25983	138	0.014	863.6	863.3	Circular	2.00
LU25984-2	U25984	U25983	138	0.015	870.8	870.3	Natural	1.00
LU25990-1	U25990	U25991	32	0.014	864.1	864.0	Circular	2.00
LU25990-2	U25990	U25991	32	0.015	871.4	871.3	Natural	1.00
LU25991-1	U25991	U25984	162	0.014	864.0	863.6	Circular	2.00
LU25991-2	U25991	U25984	162	0.015	871.3	870.8	Natural	1.00
LU25994-1	U25994	U25990	143	0.014	864.7	864.1	Circular	2.00
LU25994-2	U25994	U25990	143	0.015	871.8	871.3	Natural	1.00
LU25998-1	U25998	U25994	162	0.014	865.3	864.7	Circular	2.00
LU25998-2	U25998	U25994	162	0.015	872.3	871.8	Natural	1.00
LU25999-1	U25999	U25998	27	0.014	866.5	865.3	Circular	1.25
LU25999-2	U25999	U25998	27	0.015	872.4	872.3	Natural	1.00
LU26011-1	U26011	U25999	135	0.014	872.6	866.5	Circular	1.25
LU26011-2	U26011	U25999	135	0.015	879.3	872.3	Natural	1.00
LU26013-1	U26013	U26011	97	0.014	878.0	872.6	Circular	1.25
LU26013-2	U26013	U26011	97	0.015	883.8	879.3	Natural	1.00
LU26017-1	U26017	U26018	33	0.014	878.8	878.3	Circular	1.25
LU26017-2	U26017	U26018	33	0.015	886.3	885.8	Natural	1.00
LU26018-1	U26018	U26013	42	0.014	878.3	878.0	Circular	1.25
LU26018-2	U26018	U26013	42	0.015	885.8	883.8	Natural	1.00
LU26020-1	U26020	U26017	25	0.014	879.2	878.8	Circular	1.25
LU26020-2	U26020	U26017	25	0.015	886.3	886.3	Natural	1.00
LU26020-3	U26020	U25410	661	0.015	886.3	874.3	Natural	1.00
LU26022-1	U26022	U26020	35	0.014	879.8	879.2	Circular	1.25
LU26022-2	U26022	U26020	35	0.015	887.3	886.3	Natural	1.00
LU26024-1	U26024	U26022	127	0.014	885.3	879.8	Circular	1.00
LU26024-2	U26024	U26022	127	0.015	892.3	887.3	Natural	1.00
LU26029-1	U26029	U26024	160	0.014	887.3	885.3	Circular	1.00
LU26029-2	U26029	U26024	160	0.015	894.3	892.3	Natural	1.00
LU26067-1	U26067	U25981	32	0.014	863.5	863.3	Circular	2.00
LU26067-2	U26067	U25981	32	0.015	870.3	870.2	Natural	1.00
LU26106-1	U26106	U25957	74	0.014	860.1	859.1	Circular	0.75
LU26106-2	U26106	U25957	74	0.015	867.0	868.0	Natural	1.00
LU26125-1	U26125	U26067	163	0.014	864.2	863.5	Circular	2.00
LU26125-2	U26125	U26067	163	0.015	871.0	870.3	Natural	1.00
LU26127-1	U26127	U25948	217	0.014	860.7	859.6	Circular	0.75
LU26127-2	U26127	U25948	217	0.015	865.3	867.1	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU26132-1	U26132	U26125	44	0.014	864.4	864.2	Circular	2.00
LU26132-2	U26132	U26125	44	0.015	871.1	871.0	Natural	1.00
LU26165-1	U26165	U26132	189	0.014	865.0	864.4	Circular	2.00
LU26165-2	U26165	U26132	189	0.015	871.6	871.1	Natural	1.00
LU26167-1	U26167	U26165	28	0.014	865.1	865.0	Circular	2.00
LU26167-2	U26167	U26165	28	0.015	871.6	871.6	Natural	1.00
LU26487-1	U26487	U26167	211	0.014	865.6	865.1	Circular	2.00
LU26487-2	U26487	U26167	211	0.015	872.3	871.6	Natural	1.00
LU26513-1	U26513	U26516	161	0.014	878.3	871.7	Circular	1.25
LU26513-2	U26513	U26516	161	0.015	885.3	878.8	Natural	1.00
LU26516-1	U26516	U26521	125	0.014	871.7	866.6	Circular	1.25
LU26516-2	U26516	U26521	125	0.015	878.8	873.3	Natural	1.00
LU26521-1	U26521	U26487	33	0.014	866.6	865.6	Circular	1.25
LU26521-2	U26521	U26487	33	0.015	873.3	872.3	Natural	1.00
LU26552-1	U26552	U26487	159	0.014	871.3	865.6	Circular	1.25
LU26552-2	U26552	U26487	159	0.015	878.8	872.3	Natural	1.00
LU26555-1	U26555	U26552	119	0.014	875.6	871.3	Circular	1.25
LU26555-2	U26555	U26552	119	0.015	882.3	878.8	Natural	1.00
LU26556-1	U26556	U26555	65	0.014	879.3	875.6	Circular	1.25
LU26556-2	U26556	U26555	65	0.015	885.3	882.3	Natural	1.00
LU26556-3	U26556	U25991	675	0.015	885.3	871.3	Natural	1.00
LU26558-1	U26558	U26556	149	0.014	882.8	879.3	Circular	1.25
LU26558-2	U26558	U26556	149	0.015	889.3	885.3	Natural	1.00
LU26560-1	U26560	U26513	28	0.014	878.8	878.3	Circular	1.25
LU26560-2	U26560	U26513	28	0.015	885.3	885.3	Natural	1.00
LU26560-3	U26560	U25976	680	0.015	885.3	869.3	Natural	0.50
LU26563-1	U26563	U26558	189	0.014	887.3	882.8	Circular	1.25
LU26563-2	U26563	U26558	189	0.015	893.3	889.3	Natural	1.00
LU26563-3	U26563	U25998	676	0.015	893.3	872.3	Natural	1.00
LU26565-1	U26565	U26563	141	0.014	894.5	887.3	Circular	1.00
LU26565-2	U26565	U26563	141	0.015	899.8	893.3	Natural	1.00
LU26570-1	U26570	U26565	139	0.014	898.8	894.5	Circular	1.00
LU26570-2	U26570	U26565	139	0.015	906.3	899.8	Natural	1.00
LU26570-3	U26570	U26020	675	0.015	906.3	886.3	Natural	1.00
LU26576-1	U26576	U26570	91	0.014	900.3	898.8	Circular	1.00
LU26576-2	U26576	U26570	91	0.015	906.3	906.3	Natural	1.00
LU26582-1	U26582	U26576	128	0.014	901.8	900.3	Circular	1.00
LU26582-2	U26582	U26576	128	0.015	908.3	906.3	Natural	1.00
LU26585-1	U26585	U26582	152	0.014	903.6	901.8	Circular	1.00
LU26585-2	U26585	U26582	152	0.015	910.3	908.3	Natural	1.00
LU26585-3	U26585	U26029	672	0.015	910.3	894.3	Natural	1.00
LU26629-1	U26629	U26487	49	0.014	872.6	866.3	Circular	0.75
LU26629-2	U26629	U26487	49	0.015	879.7	872.3	Natural	1.00
LU26652-1	U26652	U26560	144	0.014	882.7	878.8	Circular	1.00
LU26652-2	U26652	U26560	144	0.015	889.3	885.3	Natural	1.00
LU26697-1	U26697	U26652	131	0.014	886.3	882.7	Circular	1.00
LU26697-2	U26697	U26652	131	0.015	893.3	889.3	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU26704-1	U26704	U26705	172	0.014	877.3	875.3	Circular	0.75
LU26704-2	U26704	U26705	172	0.015	883.7	881.7	Natural	1.00
LU26705-1	U26705	U26629	268	0.014	875.3	872.6	Circular	0.75
LU26705-2	U26705	U26629	268	0.015	881.7	879.7	Natural	1.00
LU26724-1	U26724	U26697	124	0.014	888.0	886.3	Circular	1.00
LU26724-2	U26724	U26697	124	0.015	894.3	893.3	Natural	1.00
LU26732-1	U26732	U26724	46	0.014	888.6	888.0	Circular	1.00
LU26732-2	U26732	U26724	46	0.015	894.8	894.3	Natural	1.00
LU26739-1	U26739	U26732	24	0.014	889.3	888.6	Circular	1.00
LU26739-2	U26739	U26732	24	0.015	895.3	894.8	Natural	1.00
LU26773-1	U26773	U26739	53	0.014	890.3	889.3	Circular	1.00
LU26773-2	U26773	U26739	53	0.015	896.3	895.3	Natural	1.00
LU27025-1	U27025	U26773	100	0.014	892.2	890.3	Circular	1.00
LU27025-2	U27025	U26773	100	0.015	898.3	896.3	Natural	1.00
LU27166-1	U27166	U27025	54	0.014	896.8	892.2	Circular	1.00
LU27166-2	U27166	U27025	54	0.015	901.3	898.3	Natural	1.00
LU27229-1	U27229	U27166	133	0.014	898.8	896.8	Circular	1.00
LU27229-2	U27229	U27166	133	0.015	905.3	901.3	Natural	1.00
LU27349-1	U27349	U27229	140	0.014	900.2	898.8	Circular	1.00
LU27349-2	U27349	U27229	140	0.015	907.8	905.3	Natural	1.00
LU27399-1	U27399	U27349	165	0.014	901.6	900.2	Circular	1.00
LU27399-2	U27399	U27349	165	0.015	910.1	907.8	Natural	1.00
LU27437-1	U27437	U27399	88	0.014	902.4	901.9	Circular	1.00
LU27437-2	U27437	U27399	88	0.015	912.0	910.1	Natural	1.00
LU27577-1	U27577	U27583	219	0.014	905.4	903.8	Circular	1.00
LU27577-2	U27577	U27583	219	0.015	910.9	914.6	Natural	1.00
LU27583-1	U27583	U27437	210	0.014	903.7	902.4	Circular	1.00
LU27583-2	U27583	U27437	210	0.015	914.6	912.0	Natural	1.00
LU27793-1	U27793	U27437	219	0.014	911.1	904.7	Circular	1.00
LU27793-2	U27793	U27437	219	0.015	919.3	912.0	Natural	1.00
LU99999-1	U24793	U24784	159	0.014	840.3	839.8	Circular	2.00
LU99999-2	U24793	U24784	159	0.015	846.3	847.3	Natural	1.00
LV13912-1.	V13912	V13973	74	0.014	868.3	867.9	Circular	1.00
LV13912-2.	V13912	V13973	74	0.015	873.6	873.4	Natural	1.00
LV13967-1.	V13967	V13972	150	0.014	868.0	867.3	Circular	0.75
LV13967-2.	V13967	V13972	150	0.015	872.7	873.4	Natural	1.00
LV13972-1.	V13972	V13973	14	0.014	867.3	867.2	Circular	1.00
LV13972-2.	V13972	V13973	14	0.015	873.4	873.4	Natural	1.00
LV13973-1.	V13973	V14497	293	0.014	867.2	866.8	Circular	1.25
LV13973-2.	V13973	V14497	293	0.015	873.4	872.8	Natural	1.00
LV14497-1.	V14497	V14594	171	0.014	866.7	866.2	Circular	1.75
LV14497-2	V14497	MH178	235	0.015	873.2	872.6	Natural	1.00
LV14497-2.	V14497	V14594	171	0.015	872.6	872.5	Natural	1.00
LV14500-1.	V14500-1	V14500-2	201	0.014	868.7	868.0	Circular	1.25
LV14500-2.	V14500-1	V14500-2	201	0.015	874.3	874.6	Natural	1.00
LV14521-1.	MH136	V14593	161	0.014	868.2	867.6	Circular	1.25
LV14521-2.	MH136	V14593	161	0.015	875.1	875.0	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LV14593-1	V14593	V14709	197	0.014	867.6	867.0	Circular	1.25
LV14593-2	V14593	V14709	197	0.015	875.0	874.6	Natural	1.00
LV14594-1.	V14594	V14718	224	0.014	866.2	865.7	Circular	1.75
LV14594-2.	V14594	V14718	224	0.015	872.5	872.3	Natural	1.00
LV14618-1	V14500-2	V14722	201	0.014	868.0	867.6	Circular	1.25
LV14618-2	V14500-2	V14722	201	0.015	874.6	875.0	Natural	1.00
LV14625-1	V14625	V14721	193	0.014	871.6	870.6	Circular	0.75
LV14625-2	V14625	V14721	193	0.015	877.6	877.2	Natural	1.00
LV14709-1	V14709	V14976	201	0.014	867.0	866.4	Circular	1.25
LV14709-2	V14709	V14976	201	0.015	874.6	874.3	Natural	1.00
LV14718-1	V14718	V15177	211	0.014	865.7	865.3	Circular	1.75
LV14718-2	V14718	V15177	211	0.015	872.3	874.3	Natural	1.00
LV14721-1	V14721	V15138	197	0.014	870.6	869.6	Circular	0.75
LV14721-2	V14721	V15138	197	0.015	877.2	874.8	Natural	1.00
LV14722-1	V14722	V14958	157	0.014	867.6	867.4	Circular	1.25
LV14722-2	V14722	V14958	157	0.015	875.0	875.3	Natural	1.00
LV14958-1	V14958	V15129	37	0.014	867.4	867.3	Circular	1.25
LV14958-2	V14958	V15129	37	0.015	875.3	875.3	Natural	1.00
LV14976-1	V14976	V15211	48	0.014	866.4	866.3	Circular	1.25
LV14976-2	V14976	V15211	48	0.015	874.3	874.3	Natural	1.00
LV15129-1	V15129	V15137	166	0.014	867.3	866.8	Circular	1.50
LV15129-2	V15129	V15137	166	0.015	875.3	874.8	Natural	1.00
LV15133-1	V15133	V15211	38	0.014	866.3	866.3	Circular	1.00
LV15133-2	V15133	V15211	38	0.015	874.3	874.3	Natural	1.00
LV15134-1	V15134	V15138	134	0.014	867.8	867.0	Circular	1.00
LV15134-2	V15134	V15138	134	0.015	875.3	874.8	Natural	1.00
LV15135-1	V15135	V15129	163	0.014	868.1	867.3	Circular	1.00
LV15135-2	V15135	V15129	163	0.015	875.1	875.3	Natural	1.00
LV15137-1	V15137	V15211	164	0.014	866.8	866.3	Circular	1.50
LV15137-2	V15137	V15211	164	0.015	874.8	874.3	Natural	1.00
LV15138-1	V15138	V15133	127	0.014	867.0	866.3	Circular	1.00
LV15138-2	V15138	V15133	127	0.015	874.8	874.3	Natural	1.00
LV15144-1	V15144	V15135	138	0.014	868.8	868.1	Circular	1.00
LV15144-2	V15144	V15135	138	0.015	874.8	875.1	Natural	1.00
LV15144-3	V15144	V15885	679	0.015	874.8	873.3	Natural	1.00
LV15177-1	V15177	V15330	230	0.014	865.3	864.9	Circular	2.00
LV15177-2	V15177	V15330	230	0.015	874.3	873.3	Natural	1.00
LV15177-3	V15177	M15102	426	0.015	874.3	869.3	Natural	1.00
LV15211-1	V15211	V15325	201	0.014	866.3	865.7	Circular	2.00
LV15211-2	V15211	V15325	201	0.015	874.3	873.3	Natural	1.00
LV15325-1	V15325	V15405	238	0.014	865.7	865.0	Circular	2.00
LV15325-2	V15325	V15405	238	0.015	873.3	872.3	Natural	1.00
LV15330-1	V15330	V15403	211	0.014	864.9	864.5	Circular	2.00
LV15330-2	V15330	V15403	211	0.015	873.3	872.6	Natural	1.00
LV15388-1	V15388	V15479	145	0.014	869.3	867.8	Circular	0.75
LV15388-2	V15388	V15479	145	0.015	873.0	873.3	Natural	1.00
LV15403-1	V15403	V15871	241	0.014	864.5	864.0	Circular	2.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LV15403-2	V15403	V15871	241	0.015	872.6	872.3	Natural	1.00
LV15405-1	V15405	V15737	191	0.014	865.0	864.4	Circular	2.00
LV15405-2	V15405	V15737	191	0.015	872.3	871.3	Natural	1.00
LV15479-1	V15479	V15887	140	0.014	867.8	866.3	Circular	0.75
LV15479-2	V15479	V15887	140	0.015	873.3	872.8	Natural	1.00
LV15737-1	V15737	V15855	24	0.014	864.4	862.8	Circular	2.00
LV15737-2	V15737	V15855	24	0.015	871.3	871.3	Natural	1.00
LV15855-1	V15855	V15943	24	0.014	862.8	862.3	Circular	2.00
LV15855-2	V15855	V15943	24	0.015	871.3	871.3	Natural	1.00
LV15871-1	V15871	V15884	164	0.014	864.0	863.5	Circular	2.25
LV15871-2	V15871	V15884	164	0.015	872.3	872.8	Natural	1.00
LV15871-3	V15871	L15870	425	0.015	872.3	871.3	Natural	1.00
LV15873-1	V15873	V15874	33	0.014	853.3	853.2	Circular	8.00
LV15873-2	V15873	V15874	33	0.015	863.3	863.2	Natural	1.00
LV15874-1	V15874	V15881	103	0.014	853.2	853.0	Circular	8.00
LV15874-2	V15874	V15881	103	0.015	863.2	864.3	Natural	1.00
LV15876-1	V15876	V15900	35	0.014	850.2	862.8	Circular	2.50
LV15876-2	V15876	V15900	35	0.015	867.1	868.0	Natural	1.00
LV15877-1	V15877	V15876	6	0.014	850.1	850.2	Circular	8.00
LV15877-2	V15877	V15876	6	0.015	867.1	867.1	Natural	1.00
LV15881-1	V15881	V15877	103	0.014	853.0	852.8	Circular	8.00
LV15881-2	V15881	V15877	103	0.015	864.3	867.1	Natural	1.00
LV15882-1	V15882	V15885	65	0.014	863.1	862.9	Circular	2.50
LV15882-2	V15882	V15885	65	0.015	873.3	873.3	Natural	1.00
LV15884-1	V15884	V15882	116	0.014	863.5	863.1	Circular	2.25
LV15884-2	V15884	V15882	116	0.015	872.8	873.3	Natural	1.00
LV15885-1	V15885	V15887	140	0.014	862.9	862.6	Circular	2.25
LV15885-2	V15885	V15887	140	0.015	873.3	872.8	Natural	1.00
LV15887-1	V15887	V15888	134	0.014	862.6	862.4	Circular	2.25
LV15887-2	V15887	V15888	134	0.015	872.8	872.3	Natural	1.00
LV15888-1	V15888	V15889	50	0.014	862.4	862.3	Circular	2.25
LV15888-2	V15888	V15889	50	0.015	872.3	872.3	Natural	1.00
LV15889-1	V15889	V15890	151	0.014	862.3	861.8	Circular	2.25
LV15889-2	V15889	V15890	151	0.015	872.3	871.8	Natural	1.00
LV15890-1	V15890	V15943	154	0.014	861.8	861.3	Circular	2.25
LV15890-2	V15890	V15943	154	0.015	871.8	871.3	Natural	1.00
LV15892-1	V15892	V15943	26	0.014	861.4	861.3	Circular	1.25
LV15892-2	V15892	V15943	26	0.015	871.3	871.3	Natural	1.00
LV15893-1	V15893	V15894	121	0.014	862.3	861.9	Circular	1.25
LV15893-2	V15893	V15894	121	0.015	868.7	869.8	Natural	1.00
LV15894-1	V15894	V15892	151	0.014	861.9	861.4	Circular	1.25
LV15894-2	V15894	V15892	151	0.015	869.8	871.3	Natural	1.00
LV15897-1	V15897	V15873	32	0.014	855.6	855.2	Circular	2.00
LV15897-2	V15897	V15873	32	0.015	863.6	863.3	Natural	1.00
LV15898-1	V15898	V15893	73	0.014	863.2	862.5	Circular	1.00
LV15898-2	V15898	V15893	73	0.015	868.8	868.7	Natural	1.00
LV15898-3	V15898	V15897	296	0.015	868.8	863.6	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LV15900-1	V15900	V16025	41	0.014	862.8	862.7	Circular	2.00
LV15900-2	V15900	V16025	41	0.015	868.0	867.8	Natural	1.00
LV15943-1	V15943	V16089	238	0.014	861.3	860.9	Circular	3.75
LV15943-2	V15943	V16089	238	0.015	871.3	871.0	Natural	1.00
LV16006-1	V16006	V15871	30	0.014	866.8	866.6	Circular	1.00
LV16006-2	V16006	V15871	30	0.015	872.3	872.3	Natural	1.00
LV16025-1	V16025	V16106	283	0.014	862.7	861.5	Circular	2.50
LV16025-2	V16025	V16106	283	0.015	867.8	870.7	Natural	1.00
LV16087-1	V16087	V16006	222	0.014	868.0	866.8	Circular	1.00
LV16087-2	V16087	V16006	222	0.015	872.3	872.3	Natural	1.00
LV16089-1	V16089	V16136	227	0.014	860.9	860.6	Circular	3.75
LV16089-2	V16089	V16136	227	0.015	871.0	870.6	Natural	1.00
LV16106-1	V16106	V16461	315	0.014	861.5	860.3	Circular	3.00
LV16106-2	V16106	V16461	315	0.015	870.7	873.4	Natural	1.00
LV16136-1	V16136	V16485	172	0.014	860.6	860.3	Circular	3.75
LV16136-2	V16136	V16485	172	0.015	870.6	870.5	Natural	1.00
LV16160-1	V16160	V16571	170	0.014	864.3	863.3	Circular	0.75
LV16160-2	V16160	V16571	170	0.015	867.4	870.6	Natural	1.00
LV16461-1	V16461	V16582	41	0.014	860.3	860.0	Circular	3.00
LV16461-2	V16461	V16582	41	0.015	873.4	873.4	Natural	1.00
LV16485-1	V16485	V16578	29	0.014	860.3	860.2	Circular	3.75
LV16485-2	V16485	V16578	29	0.015	870.5	870.3	Natural	1.00
LV16562-1	V16562	V16564	140	0.014	865.8	865.5	Circular	1.50
LV16562-2	V16562	V16564	140	0.015	873.3	872.8	Natural	1.00
LV16563-1	V16563	V16562	43	0.014	866.8	865.8	Circular	1.00
LV16563-2	V16563	V16562	43	0.015	873.3	873.3	Natural	1.00
LV16564-1	V16564	V16565	140	0.014	865.5	865.2	Circular	1.50
LV16564-2	V16564	V16565	140	0.015	872.8	872.3	Natural	1.00
LV16565-1	V16565	V16566	64	0.014	865.2	864.9	Circular	1.50
LV16565-2	V16565	V16566	64	0.015	872.3	872.3	Natural	1.00
LV16566-1	V16566	V16567	142	0.014	864.9	864.1	Circular	1.75
LV16566-2	V16566	V16567	142	0.015	872.3	871.8	Natural	1.00
LV16567-1	V16567	V16568	147	0.014	864.1	863.3	Circular	1.75
LV16567-2	V16567	V16568	147	0.015	871.8	871.3	Natural	1.00
LV16568-1	V16568	V16569	18	0.014	863.3	863.2	Circular	2.25
LV16568-2	V16568	V16569	18	0.015	871.3	871.3	Natural	1.00
LV16569-1	V16569	V16573	230	0.014	863.2	861.9	Circular	2.25
LV16569-2	V16569	V16573	230	0.015	871.3	870.3	Natural	1.00
LV16571-1	V16571	V16587	135	0.014	860.0	859.9	Circular	5.00
LV16571-2	V16571	V16587	135	0.015	870.6	869.3	Natural	1.00
LV16572-1	V16572	V16577	293	0.014	858.5	858.0	Circular	5.00
LV16572-2	V16572	V16577	293	0.015	871.3	870.3	Natural	1.00
LV16573-1	V16573	V16578	96	0.014	861.9	861.3	Circular	2.25
LV16573-2	V16573	V16578	96	0.015	870.3	870.3	Natural	1.00
LV16574-1	V16574	V16571	143	0.014	860.2	860.0	Circular	5.00
LV16574-2	V16574	V16571	143	0.015	870.3	870.6	Natural	1.00
LV16575-1	V16575	V16572	35	0.014	858.6	858.5	Circular	5.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LV16575-2	V16575	V16572	35	0.015	871.3	871.3	Natural	1.00
LV16577-1	V16577	VWEIR	0	0.000	0.0	0.0	Circular	0.00
LV16578-1	V16578	V16574	10	0.014	860.2	860.2	Circular	5.00
LV16578-2	V16578	V16574	10	0.015	870.3	870.3	Natural	1.00
LV16582-1	V16582	V16575	289	0.014	859.3	858.6	Circular	5.00
LV16582-2	V16582	V16575	289	0.015	873.4	871.3	Natural	1.00
LV16583-1	V16583	V16588	30	0.014	859.4	859.4	Circular	5.00
LV16583-2	V16583	V16588	30	0.015	870.3	870.3	Natural	1.00
LV16583-3	V16583	V15897	673	0.015	870.3	863.6	Natural	1.00
LV16584-1	V16584	V16582	39	0.014	859.3	859.3	Circular	5.00
LV16584-2	V16584	V16582	39	0.015	873.4	873.4	Natural	1.00
LV16587-1	V16587	V16590	26	0.014	859.9	859.8	Circular	5.00
LV16587-2	V16587	V16590	26	0.015	869.3	869.3	Natural	1.00
LV16588-1	V16588	V16584	295	0.014	859.4	859.3	Circular	5.00
LV16588-2	V16588	V16584	295	0.015	870.3	873.4	Natural	1.00
LV16589-1	V16589	V16591	18	0.014	859.8	859.8	Circular	5.00
LV16589-2	V16589	V16591	18	0.015	869.3	869.3	Natural	1.00
LV16589-3	V16590	V15898	675	0.015	869.3	868.8	Natural	1.00
LV16590-1	V16590	V16589	45	0.014	859.8	859.8	Circular	5.00
LV16590-2	V16590	V16589	45	0.015	869.3	869.3	Natural	1.00
LV16591-1	V16591	V16583	270	0.014	859.8	859.4	Circular	5.00
LV16591-2	V16591	V16583	270	0.015	869.3	870.3	Natural	1.00
LV16649-1	V16577	V16934	542	0.014	858.0	855.2	Circular	5.00
LV16649-2	V16577	V16934	542	0.015	870.3	862.6	Natural	1.00
LV16687-1	V16687	V16574	162	0.014	864.1	863.3	Circular	1.75
LV16687-2	V16687	V16574	162	0.015	871.3	870.3	Natural	1.00
LV16693-1	V16693	V16562	185	0.014	866.1	865.8	Circular	1.25
LV16693-2	V16693	V16562	185	0.015	873.0	873.3	Natural	1.00
LV16701-1	V16701	V16572	190	0.014	859.6	859.3	Circular	1.75
LV16701-2	V16701	V16572	190	0.015	869.6	871.3	Natural	1.00
LV16722-1	V16722	V16693	105	0.014	866.3	866.1	Circular	1.25
LV16722-2	V16722	V16693	105	0.015	872.8	873.0	Natural	1.00
LV16730-1	V16730	V16687	198	0.014	865.1	864.1	Circular	1.75
LV16730-2	V16730	V16687	198	0.015	872.3	871.3	Natural	1.00
LV16731-1	V16731	V16722	89	0.014	866.5	866.3	Circular	1.25
LV16731-2	V16731	V16722	89	0.015	872.6	872.8	Natural	1.00
LV16738-1	V16738	V16701	186	0.014	859.9	859.6	Circular	1.75
LV16738-2	V16738	V16701	186	0.015	867.8	869.6	Natural	1.00
LV1682	KINGS PND	SAN SEWER	50	0.014	844.3	844.2	Circular	1.00
LV16975-1	V16975	V16731	186	0.014	866.8	866.5	Circular	1.25
LV16975-2	V16975	V16731	186	0.015	872.3	872.6	Natural	1.00
LV16975-3	V16975	P17061	427	0.015	872.3	864.3	Natural	1.00
LV17039-1	V17039	V16738	186	0.014	860.2	859.9	Circular	1.75
LV17039-2	V17039	V16738	186	0.015	866.3	867.8	Natural	1.00
LV17049-1	V17049	V16730	219	0.014	866.2	865.1	Circular	1.75
LV17049-2	V17049	V16730	219	0.015	873.3	872.3	Natural	1.00
LV17077-1	V16934	V17218	68	0.014	855.2	854.3	Circular	6.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LV17077-2	V16934	V17218	68	0.015	862.6	862.6	Natural	1.00
LV17147-1	V17147	V17039	19	0.014	860.3	860.2	Circular	1.75
LV17147-2	V17147	V17039	19	0.015	866.3	866.3	Natural	1.00
LV17147-3	V17147	V17218	316	0.015	866.3	862.6	Natural	1.00
LV17149-1	V17149	V17151	301	0.014	857.6	856.3	Circular	2.00
LV17149-2	V17149	V17151	301	0.015	863.4	862.1	Natural	1.00
LV17150-1	V17150	V17149	33	0.014	857.8	857.6	Circular	2.00
LV17150-2	V17150	V17149	33	0.015	863.5	863.4	Natural	1.00
LV17150-3	V17150	V17846	661	0.015	863.5	860.2	Natural	1.00
LV17151-1	V17151	V17218	36	0.014	856.3	856.3	Circular	2.00
LV17151-2	V17151	V17218	36	0.015	862.1	862.1	Natural	1.00
LV17153-1	V17153	V17154	333	0.014	871.7	862.1	Circular	1.00
LV17153-2	V17153	V17154	333	0.015	875.3	866.6	Natural	1.00
LV17154-1	V17154	V17147	35	0.014	861.9	860.8	Circular	1.00
LV17154-2	V17154	V17147	35	0.015	866.6	866.3	Natural	1.00
LV17170-1	V17170	V17173	180	0.014	867.3	866.8	Circular	1.00
LV17170-2	V17170	V17173	180	0.015	874.3	873.8	Natural	1.00
LV17170-3	V17170	V16568	586	0.015	874.3	871.3	Natural	1.00
LV17173-1	V17173	V17049	161	0.014	866.8	866.3	Circular	1.00
LV17173-2	V17173	V17049	161	0.015	873.8	873.3	Natural	1.00
LV17178-1	V17178	V17049	173	0.014	866.7	866.3	Circular	1.00
LV17178-2	V17178	V17049	173	0.015	873.8	873.3	Natural	1.00
LV17180-1	V17180	V17178	134	0.014	867.1	866.7	Circular	1.00
LV17180-2	V17180	V17178	134	0.015	874.1	873.8	Natural	1.00
LV17182-1	V17182	V17180	95	0.014	867.3	867.1	Circular	1.00
LV17182-2	V17182	V17180	95	0.015	874.3	874.1	Natural	1.00
LV17182-3	V17182	V16589	586	0.015	874.3	869.3	Natural	1.00
LV17210-1	V17210	V17049	36	0.014	866.4	866.2	Circular	1.50
LV17210-2	V17210	V17049	36	0.015	873.3	873.3	Natural	1.00
LV17218-1	V17218	V17346	395	0.014	854.3	853.6	Special	4.50
LV17218-2	V17218	V17346	395	0.015	862.1	860.2	Natural	1.00
LV17219-1	V17219	V17147	34	0.014	860.3	860.3	Circular	1.75
LV17219-2	V17219	V17147	34	0.015	866.3	866.3	Natural	1.00
LV17275-1	V17275	V17210	170	0.014	866.9	866.4	Circular	1.50
LV17275-2	V17275	V17210	170	0.015	874.3	873.3	Natural	1.00
LV17285-1	V17285	V17219	206	0.014	860.6	860.3	Circular	1.50
LV17285-2	V17285	V17219	206	0.015	866.8	866.3	Natural	1.00
LV17295-1	V17295	V16975	293	0.014	868.1	867.1	Circular	1.00
LV17295-2	V17295	V16975	293	0.015	871.3	872.3	Natural	1.00
LV17334-1	V17334	V17275	214	0.014	867.6	866.9	Circular	1.50
LV17334-2	V17334	V17275	214	0.015	875.3	874.3	Natural	1.00
LV17346-1	V17346	V17647	204	0.014	853.6	853.1	Special	4.50
LV17346-2	V17346	V17647	204	0.015	860.2	861.2	Natural	1.00
LV17353-1	V17353	V17285	206	0.014	860.9	860.6	Circular	1.50
LV17353-2	V17353	V17285	206	0.015	867.1	866.8	Natural	1.00
LV17354-1	V17354	V17842	181	0.014	855.5	854.4	Circular	0.75
LV17354-2	V17354	V17842	181	0.015	860.3	860.5	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LV17538-1	V17538	V17353	170	0.014	861.2	860.9	Circular	1.50
LV17538-2	V17538	V17353	170	0.015	867.3	867.1	Natural	1.00
LV17647-1	V17647	V17947	79	0.014	853.1	853.0	Circular	5.50
LV17647-2	V17647	V17947	79	0.015	861.2	862.1	Natural	1.00
LV17785-1	V17785	V17538	37	0.014	862.6	861.2	Circular	1.50
LV17785-2	V17785	V17538	37	0.015	867.3	867.3	Natural	1.00
LV17785-3	V17785	V17947	324	0.015	867.3	862.1	Natural	1.00
LV17803-1	V17803	V17334	249	0.014	868.3	867.6	Circular	1.50
LV17803-2	V17803	V17334	249	0.015	876.3	875.3	Natural	1.00
LV17827-1	V17827	V17830	85	0.014	898.6	896.5	Circular	1.00
LV17827-2	V17827	V17830	85	0.015	901.7	901.1	Natural	1.00
LV17827-3	V17827	V18539	661	0.015	901.7	881.8	Natural	1.00
LV17828-1	V17828	V17831	294	0.014	884.0	857.6	Circular	1.25
LV17828-2	V17828	V17831	294	0.015	891.0	862.5	Natural	1.00
LV17830-1	V17830	V17833	324	0.014	895.5	887.4	Circular	1.00
LV17830-2	V17830	V17833	324	0.015	901.1	891.1	Natural	1.00
LV17831-1	V17831	V17832	49	0.014	857.5	857.3	Circular	2.50
LV17831-2	V17831	V17832	49	0.015	862.5	863.0	Natural	1.00
LV17832-1	V17832	V17835	140	0.014	857.3	856.6	Circular	2.50
LV17832-2	V17832	V17835	140	0.015	863.0	863.5	Natural	1.00
LV17833-1	V17833	V17828	41	0.014	884.7	884.2	Circular	1.25
LV17833-2	V17833	V17828	41	0.015	891.1	891.0	Natural	1.00
LV17835-1	V17835	V17839	141	0.014	854.9	854.2	Circular	2.50
LV17835-2	V17835	V17839	141	0.015	863.5	863.0	Natural	1.00
LV17839-1	V17839	V17840	29	0.014	854.2	854.0	Circular	3.00
LV17839-2	V17839	V17840	29	0.015	863.0	862.9	Natural	1.00
LV17840-1	V17840	V17846	295	0.014	854.0	853.1	Circular	3.00
LV17840-2	V17840	V17846	295	0.015	862.9	860.2	Natural	1.00
LV17841-1	V17841	V17947	71	0.014	852.2	852.1	Circular	3.50
LV17841-2	V17841	V17947	71	0.015	860.9	862.1	Natural	1.00
LV17842-1	V17842	V17841	125	0.014	852.5	852.3	Circular	3.50
LV17842-2	V17842	V17841	125	0.015	860.5	860.9	Natural	1.00
LV17843-1	V17843	V17842	124	0.014	853.0	852.5	Circular	3.50
LV17843-2	V17843	V17842	124	0.015	860.0	860.5	Natural	1.00
LV17846-1	V17846	V17843	53	0.014	853.1	853.0	Circular	3.50
LV17846-2	V17846	V17843	53	0.015	860.0	860.2	Natural	1.00
LV17863-1	V17863	V17866	141	0.014	869.3	868.8	Circular	1.00
LV17863-2	V17863	V17866	141	0.015	875.3	875.8	Natural	1.00
LV17863-3	V17863	P17914	364	0.015	875.3	870.0	Natural	1.00
LV17866-1	V17866	V17803	168	0.014	868.8	868.3	Circular	1.00
LV17866-2	V17866	V17803	168	0.015	875.8	876.3	Natural	1.00
LV17868-1	V17868	V17803	16	0.014	868.6	868.3	Circular	1.00
LV17868-2	V17868	V17803	16	0.015	876.3	876.3	Natural	1.00
LV17869-1	V17869	V17868	124	0.014	869.4	868.6	Circular	1.00
LV17869-2	V17869	V17868	124	0.015	876.6	876.3	Natural	1.00
LV17870-1	V17870	V17869	129	0.014	870.3	869.4	Circular	1.00
LV17870-2	V17870	V17869	129	0.015	876.3	876.6	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LV17872-1	V17872	V17874	117	0.014	867.7	867.4	Circular	1.25
LV17872-2	V17872	V17874	117	0.015	875.1	874.3	Natural	1.00
LV17874-1	V17874	V17875	24	0.014	867.4	866.6	Circular	1.25
LV17874-2	V17874	V17875	24	0.015	874.3	874.3	Natural	1.00
LV17875-1	V17875	V17880	40	0.014	866.6	866.6	Circular	1.25
LV17875-2	V17875	V17880	40	0.015	874.3	874.3	Natural	1.00
LV17875-3	V17875	P18460	649	0.015	874.3	870.3	Natural	1.00
LV17876-1	V17876	V17878	145	0.014	866.6	864.8	Circular	1.25
LV17876-2	V17876	V17878	145	0.015	874.3	870.8	Natural	1.00
LV17878-1	V17878	V17785	168	0.014	864.8	862.6	Circular	1.25
LV17878-2	V17878	V17785	168	0.015	870.8	867.3	Natural	1.00
LV17880-1	V17880	V17876	12	0.014	866.6	866.6	Circular	1.25
LV17880-2	V17880	V17876	12	0.015	874.3	874.3	Natural	1.00
LV17883-1	V17883	V17872	140	0.014	868.1	867.7	Circular	1.25
LV17883-2	V17883	V17872	140	0.015	875.3	875.1	Natural	1.00
LV17884-1	V17884	V17885	36	0.014	869.1	869.0	Circular	1.25
LV17884-2	V17884	V17885	36	0.015	875.3	875.3	Natural	1.00
LV17885-1	V17885	V17883	14	0.014	869.0	868.1	Circular	1.25
LV17885-2	V17885	V17883	14	0.015	875.3	875.3	Natural	1.00
LV17922-1	V17922	V17835	23	0.014	854.8	854.8	Circular	1.00
LV17922-2	V17922	V17835	23	0.015	863.1	863.5	Natural	1.00
LV17947-1	V17947	V17984	273	0.014	852.0	851.6	Circular	6.00
LV17947-2	V17947	V17984	273	0.015	862.1	867.1	Natural	1.00
LV17958-1	V17958	V17922	96	0.014	855.8	854.8	Circular	0.75
LV17958-2	V17958	V17922	96	0.015	860.3	863.1	Natural	1.00
LV17977-1	V17977	V17982	63	0.014	879.6	879.0	Circular	0.83
LV17977-2	V17977	V17982	63	0.015	885.6	885.3	Natural	1.00
LV17982-1	V17982	V17983	148	0.014	879.0	878.5	Circular	1.25
LV17982-2	V17982	V17983	148	0.015	885.3	884.2	Natural	1.00
LV17983-1	V17983	V18261	317	0.014	878.5	875.1	Circular	1.00
LV17983-2	V17983	V18261	317	0.015	884.2	879.1	Natural	1.00
LV17984-1	V17984	V18228	297	0.014	851.6	851.0	Circular	6.00
LV17984-2	V17984	V18228	297	0.015	867.1	869.5	Natural	1.00
LV18228-1	V18228	V18570	89	0.014	850.3	849.8	Circular	6.00
LV18228-2	V18228	V18570	89	0.015	869.5	869.3	Natural	1.00
LV18248-1	V18248	V18645	172	0.014	861.9	861.0	Circular	1.50
LV18248-2	V18248	V18645	172	0.015	872.5	871.5	Natural	1.00
LV18261-1	V18261	V18551	61	0.014	875.1	874.5	Circular	1.25
LV18261-2	V18261	V18551	61	0.015	880.5	880.4	Natural	1.00
LV18538-1	V18538	V18539	369	0.014	881.2	876.4	Circular	1.25
LV18538-2	V18538	V18539	369	0.015	886.3	882.0	Natural	1.00
LV18539-1	V18539	V18551	260	0.014	876.0	874.6	Circular	2.25
LV18539-2	V18539	V18551	260	0.015	882.0	880.4	Natural	1.00
LV18545-1	V18545	V18548	166	0.014	861.5	860.3	Circular	3.00
LV18545-2	V18545	V18548	166	0.015	867.5	866.6	Natural	1.00
LV18546-1	V18546	V18570	14	0.014	858.2	857.9	Circular	3.00
LV18546-2	V18546	V18570	14	0.015	869.0	869.3	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LV18547-1	V18547	V18545	195	0.014	862.9	861.5	Circular	2.50
LV18547-2	V18547	V18545	195	0.015	869.4	867.5	Natural	1.00
LV18547-3	V18547	V17840	685	0.015	869.4	862.9	Natural	1.00
LV18548-1	V18548	V18546	253	0.014	860.3	858.2	Circular	3.00
LV18548-2	V18548	V18546	253	0.015	866.6	869.0	Natural	1.00
LV18548-3	V18548	V17846	685	0.015	866.6	860.2	Natural	1.00
LV18549-1	V18549	V18550	271	0.014	873.2	869.7	Circular	2.25
LV18549-2	V18549	V18550	271	0.015	879.8	876.0	Natural	1.00
LV18550-1	V18550	V18547	337	0.014	869.7	863.1	Circular	2.25
LV18550-2	V18550	V18547	337	0.015	876.0	869.4	Natural	1.00
LV18551-1	V18551	V18549	60	0.014	874.0	873.2	Circular	2.25
LV18551-2	V18551	V18549	60	0.015	880.4	879.8	Natural	1.00
LV18570-1	V18570	V19138	633	0.014	849.1	847.4	Circular	6.00
LV18570-2	V18570	V19138	633	0.015	869.3	871.1	Natural	1.00
LV18612-1	V18612	V18248	173	0.014	862.7	861.9	Circular	1.50
LV18612-2	V18612	V18248	173	0.015	872.0	872.5	Natural	1.00
LV18645-1	V18645	V18570	203	0.014	861.0	860.0	Circular	1.50
LV18645-2	V18645	V18570	203	0.015	871.5	870.3	Natural	1.00
LV19138-1	V19138	V19728	661	0.014	847.4	846.1	Circular	6.00
LV19138-2	V19138	V19728	661	0.015	871.1	865.5	Natural	1.00
LV19728-1	V19728	V19898	306	0.014	846.1	845.3	Circular	6.00
LV19728-2	V19728	V19898	306	0.015	865.5	854.2	Natural	1.00
LV19898-1	V19898	V19981	252	0.014	837.7	835.0	Circular	6.00
LV19898-2	V19898	V19981	252	0.015	854.2	845.0	Natural	1.00
LV19981	V19981	KINGS PND	79	0.014	825.7	825.5	Circular	6.00
LV20671-1	V20772	V20617	320	0.014	839.2	836.1	Circular	2.25
LV20671-2	V20772	V20617	320	0.015	846.5	842.0	Natural	1.00
LV20772-1	V21246	V20772	304	0.014	855.0	839.9	Circular	2.00
LV20772-2	V21246	V20772	304	0.015	865.9	846.5	Natural	1.00
LV21321-1	V21321	V21246	329	0.014	872.8	859.9	Circular	1.25
LV21321-2	V21321	V21246	329	0.015	878.3	865.9	Natural	1.00
LV21430-1	V21430	V21246	356	0.014	864.5	859.4	Circular	2.00
LV21430-2	V21430	V21246	356	0.015	871.4	865.9	Natural	1.00
LV21913-1	V21913	V21430	290	0.014	867.4	864.5	Circular	2.00
LV21913-2	V21913	V21430	290	0.015	873.4	871.4	Natural	1.00
LV22048-1	V22048	V21913	32	0.014	867.7	867.4	Circular	1.50
LV22048-2	V22048	V21913	32	0.015	874.1	873.4	Natural	1.00
LV22050-1	V22050	V22055	20	0.014	874.3	873.7	Circular	1.50
LV22050-2	V22050	V22055	20	0.015	880.3	879.3	Natural	1.00
LV22056-1	V22055	V22048	282	0.014	873.7	868.1	Circular	1.50
LV22056-2	V22055	V22048	282	0.015	879.3	874.1	Natural	1.00
LV99999-1	V20617	V19981	132	0.014	835.6	835.0	Circular	2.25
LV99999-2	V20617	V19981	132	0.015	842.0	845.0	Natural	1.00
LVWEIR	VWEIR	VOUT	289	0.014	858.0	857.5	Circular	5.00
OVFL10	U23733-2	U23733-1	275	0.100	863.0	862.0	Natural	0.50
OVFL11	U23733-2	U23733-1	275	0.100	863.0	862.0	Natural	0.50
OVFL12	U24966	U24971	150	0.100	876.0	876.0	Natural	0.50

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
OVFL13	U24966	U24971	150	0.100	876.0	876.0	Natural	0.50
OVFL14	U24966	U24971	150	0.100	876.0	876.0	Natural	0.50
OVFL4	45_PL ALL	U24515	160	0.016	877.5	877.3	Natural	0.50
OVFL5	45_PL ALL	U24515	160	0.016	877.5	877.3	Natural	0.50
OVFL6	U23733-1	44_WE ALL	100	0.016	862.0	851.3	Natural	0.50
OVFL7	U23733-1	44_WE ALL	100	0.016	862.0	851.3	Natural	0.50
Prt-24-25.	24-Port	25-Port	684	0.015	865.6	862.3	Natural	1.00
Prt-27-28.	27-Port	28-Port	656	0.015	861.3	859.0	Natural	1.00
Prt-28-29.	29-Port	28-Port	688	0.015	866.1	859.0	Natural	1.00
Pump 1	U23765	U23819	10	0.014	0.1	0.0	Circular	0.05
RLS-1	R90	R53	0	0.000	0.0	0.0	Circular	0.00
RLS-2	R90	R53	0	0.000	0.0	0.0	Circular	0.00
ST \46_PO	46_PO	OAK OUT4	307	0.016	833.3	832.5	Natural	0.50
ST 4_44	4_44	44_4A	163	0.016	836.3	835.8	Natural	0.50
ST 4_PO	43_PO	OAK OUT7	265	0.016	836.5	833.5	Natural	0.50
ST 42_PL	42_PL ALL	T22803	187	0.016	873.8	878.6	Natural	0.25
ST 43_3	43_3	43_CL	355	0.016	837.5	838.5	Natural	0.50
ST 43_4	43_4	43_5	371	0.016	838.8	837.8	Natural	0.50
ST 43_5	43_5	43_5A	11	0.016	837.8	837.8	Natural	0.50
ST 43_CL	43_CL	43_4	329	0.016	838.5	838.5	Natural	0.50
ST 43_PO	43_PO	43_5	249	0.016	836.5	837.5	Natural	0.50
ST 44_2	44_2	44_3 MID	180	0.016	841.8	839.4	Natural	0.50
ST 44_3	44_3	44_3A	43	0.016	837.5	837.5	Natural	0.50
ST 44_3A	44_3A	44_CL	314	0.016	837.8	836.9	Natural	0.50
ST 44_4	44_4	44_4A	40	0.016	835.9	835.8	Natural	0.50
ST 44_4A	44_4A	44_5 B	310	0.016	835.8	834.8	Natural	0.50
ST 44_5	44_5	44_5A	40	0.016	834.8	834.8	Natural	0.50
ST 44_5 B	44_5 B	44_5A	16	0.016	834.8	834.8	Natural	0.50
ST 44_5A	44_5A	45_5	651	0.016	834.8	835.8	Natural	0.50
ST 44_CL	44_CL	44CL_MID	161	0.016	836.9	836.3	Natural	0.50
ST 44_PO	44_PO	44_5A	282	0.016	832.9	834.8	Natural	0.50
ST 44_POA	44_POA	44_PO	68	0.016	832.5	832.9	Natural	0.50
ST 44_WE	44_WE ALL	U23765	44	0.016	851.6	854.5	Natural	0.25
ST 44CL_M	44CL_MID	44_4	141	0.016	836.3	835.9	Natural	0.50
ST 45_2	45_2	45_3	240	0.016	842.7	837.8	Natural	0.50
ST 45_3	45_3	45_3 A	40	0.016	837.8	836.8	Natural	0.50
ST 45_3A	45_3 A	45_3B	9	0.016	836.8	836.8	Natural	0.50
ST 45_3B	45_3B	45_3 C	13	0.016	836.8	836.8	Natural	0.50
ST 45_3C	45_3 C	45_3 MID	150	0.016	836.8	836.3	Natural	0.50
ST 45_3M	45_3 MID	45_CL	142	0.016	836.3	835.8	Natural	0.50
ST 45_4	45_4	45_5	314	0.016	836.8	835.8	Natural	0.50
ST 45_5	45_5	46_5	626	0.016	835.8	833.5	Natural	0.50
ST 45_CL	45_CL	45_CL A	32	0.016	835.8	835.8	Natural	0.50
ST 45_CLA	45_CL A	45_4	350	0.016	835.8	836.8	Natural	0.50
ST 45_PL	45_PL ALL	45_PL ALL2	159	0.016	876.3	878.1	Natural	0.25
ST 45_PL2	45_PL ALL2	U24885	15	0.016	878.1	878.1	Natural	0.25
ST 45_PO	45_PO	45_5	269	0.016	835.3	835.8	Natural	0.50

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
ST 46_2A	46_2 A	46_2 MID	126	0.016	841.9	839.3	Natural	0.50
ST 46_2M	46_2 MID	46_MID A	45	0.016	839.3	839.3	Natural	0.50
ST 46_3	46_3	46_3A	78	0.016	835.8	835.8	Natural	0.50
ST 46_3A	46_3A	46_CL	281	0.016	835.8	833.5	Natural	0.50
ST 46_4	46_4	46_4 A	39	0.016	834.5	834.5	Natural	0.50
ST 46_4A	46_4 A	46_4 B	17	0.016	834.5	834.5	Natural	0.50
ST 46_4B	46_4 B	46_MID	139	0.016	834.5	834.0	Natural	0.50
ST 46_5	46_5	46_5A	41	0.016	833.5	833.5	Natural	0.50
ST 46_5A	46_5A	5_46 MID	410	0.016	833.5	835.8	Natural	0.50
ST 46_CL	46_CL	46_CL A	32	0.016	833.5	833.5	Natural	0.50
ST 46_CLA	46_CL A	46_4	294	0.016	833.5	834.5	Natural	0.50
ST 46_LY	46_LY ALL	U25405	301	0.016	875.3	874.3	Natural	0.25
ST 46_M	46_MID	46_5A	173	0.016	834.5	834.0	Natural	0.50
ST 46_MA	46_MID A	46_3	83	0.016	839.3	835.8	Natural	0.50
ST 46_PO	46_PO	46_PO A	62	0.016	833.3	833.5	Natural	0.50
ST 46_POA	46_PO A	46_5A	295	0.016	833.5	833.5	Natural	0.50
ST 47_2	47_2	47_3	310	0.016	843.8	842.8	Natural	0.50
ST 47_3	47_3	47_CL	350	0.016	842.8	841.8	Natural	0.50
ST 47_4	47_4	47_4 A	24	0.016	842.8	842.8	Natural	0.50
ST 47_4A	47_4 A	47_4 B	32	0.016	842.8	842.8	Natural	0.50
ST 47_4B	47_4 B	47_5	329	0.016	842.8	836.3	Natural	0.50
ST 47_5	47_5	48_5	651	0.016	836.3	831.8	Natural	0.50
ST 47_CL	47_CL	47_CL A	31	0.016	841.8	841.8	Natural	0.50
ST 47_CLA	47_CL A	47_4	278	0.016	841.8	842.8	Natural	0.50
ST 47_PO	47_PO	47_5	273	0.016	834.4	836.3	Natural	0.50
ST 48_1	48_1	48_ST	290	0.016	870.8	857.8	Natural	0.50
ST 48_3	48_3	48_CL	332	0.016	853.3	850.4	Natural	0.50
ST 48_4	48_4	48_4 A	93	0.016	840.4	838.8	Natural	0.50
ST 48_4A	48_4 A	48_5	275	0.016	838.8	831.8	Natural	0.50
ST 48_5	48_5	49_5	657	0.016	831.8	829.5	Natural	0.50
ST 48_5M	48_5 MID	48_5	140	0.016	831.4	831.8	Natural	0.50
ST 48_BL	48_BL	48_BL MID	189	0.016	866.8	866.3	Natural	0.50
ST 48_BLM	48_BL MID	48_NI	172	0.016	866.3	865.8	Natural	0.50
ST 48_CL	48_CL	48_4	326	0.016	850.4	840.4	Natural	0.50
ST 48_NI	48_NI	48_NIA	86	0.016	865.8	865.8	Natural	0.50
ST 48_NIA	48_NIA	48_1	287	0.016	865.8	870.8	Natural	0.50
ST 48_PO	48_PO	48_5 MID	123	0.016	830.8	831.4	Natural	0.50
ST 48_POA	48_PO A	48_PO	70	0.016	830.8	830.8	Natural	0.50
ST 48_ST	48_ST	ST_RU	365	0.016	857.8	850.8	Natural	1.25
ST 48_WE	48_WE	48_BL	304	0.016	880.3	866.8	Natural	0.50
ST 49_1.1	49_1	49_ST	329	0.016	860.8	846.5	Natural	0.50
ST 49_2	49_2	49_2 MID	188	0.016	845.8	843.8	Natural	0.50
ST 49_2M	49_2 MID	49_3	131	0.016	844.5	843.8	Natural	0.50
ST 49_3	49_3	49_3 A	69	0.016	843.8	843.8	Natural	0.50
ST 49_3A	49_3 A	49_CL	278	0.016	843.8	832.5	Natural	0.50
ST 49_4	49_4	49_4 A	31	0.016	828.5	828.5	Natural	0.50
ST 49_4A	49_4 A	49_5	332	0.016	828.5	829.5	Natural	0.50

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
ST 49_5	49_5	5_CRK	559	0.016	829.5	828.9	Natural	0.50
ST 49_5M	49_5 MID	49_5	145	0.016	828.5	829.5	Natural	0.50
ST 49_5MI	49_5 MID	OAK OUT1	187	0.016	828.5	827.5	Natural	0.50
ST 49_CL	49_CL	49_4	327	0.016	832.5	828.5	Natural	0.50
ST 49_NI	49_NI	49_1	309	0.016	886.6	860.8	Natural	0.50
ST 49_PLM.	49_PL MID	49_WE	293	0.016	898.4	897.6	Natural	0.50
ST 49_ST.1	49_ST	49_ST A	27	0.016	846.5	846.5	Natural	0.50
ST 49_STB	49_ST B	49_ST A	24	0.016	846.8	846.8	Natural	1.25
ST 49_STC	49_ST C	49_ST B	24	0.016	846.8	846.8	Natural	1.25
ST 49_STE	49_ST E	49_ST A	35	0.016	846.5	846.5	Natural	0.50
ST 49_WE.1	49_WE	49_WE MID	312	0.016	897.6	894.8	Natural	0.50
ST 49_WEM	49_WE MID	49_NI	364	0.016	894.8	886.6	Natural	0.50
ST 5_43AD	43_5A	44_5	627	0.016	837.8	834.8	Natural	0.50
ST 5_46M	5_46 MID	47_5	200	0.016	835.8	836.3	Natural	0.50
ST 50_1	50_1	50_ST	292	0.016	913.2	889.9	Natural	0.50
ST 50_BE	50_BE	50_NI	306	0.016	916.8	903.8	Natural	0.50
ST 50_BEA	50_BE	U27577	861	0.016	916.8	909.5	Natural	0.50
ST 50_NI	50_NI	50_NI A	53	0.016	903.8	901.5	Natural	0.50
ST 50_NIA	50_NI A	49_NI	488	0.016	901.5	886.6	Natural	0.50
ST 50_ST	50_ST	50_ST A	51	0.016	889.9	887.3	Natural	0.50
ST 50_STA	50_ST A	50_ST B	186	0.016	887.3	876.2	Natural	0.50
ST 50_STB	50_ST B	ST_49 F	209	0.016	876.2	861.5	Natural	0.50
ST 51_ST	51_ST	50_ST A	511	0.016	893.0	887.3	Natural	0.50
ST BE_50	BE_50	50_BE	44	0.016	916.8	916.8	Natural	0.50
ST BE_61	BE_61	BE_50	515	0.016	919.8	916.8	Natural	0.50
ST N510	N510	T23544	12	0.016	878.3	878.3	Natural	1.00
ST NI_RU	NI_RU	48_NI	222	0.016	871.8	865.8	Natural	0.50
ST R53	R53	R58	345	0.016	856.8	839.5	Natural	0.50
ST RU.1	RU	RU_WE	173	0.016	890.5	895.0	Natural	0.50
ST RU_WE	RU_WE	48_WE	383	0.016	895.0	880.3	Natural	0.50
ST ST_49F	ST_49 F	49_ST E	206	0.016	861.5	846.5	Natural	0.50
ST ST_RU	ST_RU	49_ST C	268	0.016	850.8	846.8	Natural	1.25
ST WE_RU	WE_RU	RU_WE	92	0.016	896.4	895.0	Natural	0.50
ST43_2	43_2	43_3	289	0.016	838.5	837.5	Natural	0.50
ST43_3	43_3	44_3	666	0.016	837.5	837.5	Natural	0.50
ST44_3 ALL	44_3 ALL2	Node386	114	0.014	832.8	832.2	Circular	1.25
ST44_3 MID	44_3 MID	44_3	123	0.016	839.4	837.5	Natural	0.50
ST44_CL	44_CL	45_CL	664	0.016	836.9	835.8	Natural	0.50
ST44_POA	44_POA	OAK OUT6	323	0.016	832.5	830.5	Natural	0.50
ST45_CL	45_CL	46_CL	655	0.016	835.8	833.5	Natural	0.50
ST48_BL AL	48_BL ALL	48_BL MID	124	0.016	864.8	866.6	Natural	0.25
ST48_NI	48_NI	U25895	707	0.016	865.8	865.6	Natural	0.50
ST48_PO	48_PO A	OAK OUT2	332	0.016	830.8	829.5	Natural	0.50
ST49_4	49_4	50_4	648	0.016	828.5	826.5	Natural	0.50
ST49_RU A	49_RU ALL2	49_RU ALL	172	0.016	895.8	900.3	Natural	0.25
Ste-24-25.	24-Stev	25-Stev	655	0.015	888.5	883.3	Natural	1.00
Ste-25-26.	25-Stev	26-Stev	657	0.015	883.3	870.3	Natural	1.00

Table B4 -XPSWMM Existing Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
UPS-1	U23765	U23819	0	0.000	0.0	0.0	Circular	0.00
V20617-3	V20617	KINGS PND	100	0.015	842.0	825.5	Natural	1.00
VPS-1	KINGS PND	N2075	0	0.000	0.0	0.0	Circular	0.00
VPS-2	KINGS PND	N2075	0	0.000	0.0	0.0	Natural	0.00
VPS-3	KINGS PND	N2075	0	0.000	0.0	0.0	Circular	0.00

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
Model: Proposed Conditions with Rate Control Structures
I-35W Corridor Drainage Study
HENNC 113114
Date: 7.3.14
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Tables

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
755.1	DS2(35th)	DS3(31ST)	2501	0.014	745.74	743.1	Circular	12
854.1	235-0	232-0	300	0.014	843.5	837.8	Circular	2.75
5745.1	35TH_D	35TH_C	300	0.012	836.6	834.2	Circular	1.5
5745.2	35TH_D	35TH_C	300	0.014	843.3	840.9	Natural	0.5
5747.1	35TH_C	220-0	250	0.014	834	832	Circular	1.75
5747.2	35TH_C	220-0	250	0.015	840.9	838.9	Natural	0.5
5751.1	220-0	224-0	420	0.014	827	824.6	Circular	2
5751.2	220-0	224-0	420	0.015	838.9	836.7	Natural	0.5
5756.1	224-0	DS2(35th)	450	0.014	824.2	821.5	Circular	2.5
5756.2	224-0	DS2(35th)	450	0.015	836.7	840.1	Natural	0.5
5759.1	MH SB 32-2	MH SB 32-4	50	0.014	836	835.7	Circular	2.5
5759.2	MH SB 32-2	MH SB 32-4	50	0.015	848.93	846.76	Natural	1
5762.1	MH SB 32-4	MH SB 35-1	254	0.014	835.7	832	Circular	2.75
5762.2	MH SB 32-4	MH SB 35-1	254	0.015	846.758	848.59	Natural	1
5764.1	MH SB 35-1	MH SB 38-3	280	0.014	832	829.76	Circular	2.75
5764.2	MH SB 35-1	MH SB 38-3	280	0.015	848.586	855.68	Natural	1
5765.1	MH SB 38-3	DS15	290	0.014	829.76	826.86	Circular	2.75
5765.2	MH SB 38-3	DS15	290	0.014	855.676	844.5	Natural	1
5768.1	MH R5 37-1	MH R5 39-1	258	0.014	816.06	814	Circular	3
5768.2	MH R5 37-1	MH R5 39-1	258	0.015	837.85	835.5	Natural	1
5770.1	MH R5 39-1	MH 2030	214	0.014	814	812.3	Circular	3
5770.2	MH R5 39-1	MH 2030	214	0.015	835.5	827.29	Natural	1
5773.1	MH 2030	MH NB 43-3	160	0.014	811.5	808.8	Circular	3.25
5773.2	MH 2030	MH NB 43-3	160	0.015	827.29	835.45	Natural	1
5778.1	CBWB 236-2	CBWB 238-2	250	0.014	821.7	816.7	Circular	1.5
5778.2	CBWB 236-2	CBWB 238-2	250	0.015	826.25	821.12	Natural	1
5780.1	CBWB 239-2	CBWB 239-4	50	0.014	814.8	814.4	Circular	3
5780.2	CBWB 239-2	CBWB 239-4	50	0.015	820.98	821.2	Natural	1
5781.1	CBWB 239-4	MH 2030	166	0.014	814.4	813.06	Circular	3
5781.2	CBWB 239-4	MH 2030	166	0.015	821.2	827.29	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
5784.1	CBWB 238-2	CBWB 239-2	50	0.014	816.7	815.7	Circular	3
5784.2	CBWB 238-2	CBWB 239-2	50	0.015	821.12	820.98	Natural	1
5787.1	CB NB 60-2	CB NB 58-4	184	0.014	825.4	824.3	Circular	1.5
5787.2	CB NB 60-2	CB NB 58-4	184	0.015	830.74	830.91	Natural	1
5789.1	CB NB 58-4	MH NB 58-3	50	0.014	824.05	823.8	Circular	1.5
5789.2	CB NB 58-4	MH NB 58-3	50	0.015	830.91	830.18	Natural	1
5793.1	MH NB 57-1	CB NB 55-2	200	0.014	822.2	821	Circular	2.5
5793.2	MH NB 57-1	CB NB 55-2	200	0.015	830.19	831.04	Natural	1
5795.1	CB NB 55-2	CB NB 52-2	250	0.014	820.75	819.5	Circular	2.75
5795.2	CB NB 55-2	CB NB 52-2	250	0.015	831.04	832.54	Natural	1
5797.1	CB NB 52-2	MH NB 50-1	200	0.014	819.5	818.5	Circular	2.75
5797.2	CB NB 52-2	MH NB 50-1	200	0.015	832.54	834.08	Natural	1
5799.1	MH NB 50-1	CB NB 49-2	100	0.014	818.5	818	Circular	3
5799.2	MH NB 50-1	CB NB 49-2	100	0.015	834.08	834.34	Natural	1
5800.1	CB NB 49-2	MH NB 45-1	400	0.014	817.75	815.75	Circular	3
5800.2	CB NB 49-2	MH NB 45-1	400	0.015	834.34	836.76	Natural	1
5802.1	MH NB 58-3	MH NB 57-4	48	0.014	823.3	823	Circular	2
5802.2	MH NB 58-3	MH NB 57-4	48	0.015	830.18	830.2	Natural	1
5803.1	MH NB 57-4	MH NB 57-1	66	0.014	823	822.7	Circular	2
5803.2	MH NB 57-4	MH NB 57-1	66	0.015	830.2	830.19	Natural	1
5806.1	MH NB 45-1	MH NB 43-3	190	0.014	815.75	814.8	Circular	3
5806.2	MH NB 45-1	MH NB 43-3	190	0.015	836.76	835.45	Natural	1
5807.1	MH NB 43-3	DS16	42	0.014	798.2	798	Circular	4.5
5807.2	MH NB 43-3	DS16	42	0.015	835.453	810.86	Natural	1
5815.1	Node536	24-35W_1	105	0.014	840.5	840.34	Circular	3.5
5815.2	Node536	24-35W_1	105	0.014	850	852.4	Natural	1
5816.1	NPondIn	North Pond	49	0.014	843.49	843	Circular	2.5
12 45_PL	45_PL ALL	45_PL ALL2	158.6	0.014	871.6	870.81	Circular	1.25
12 49RUB	49_RU ALL2	U26773	170	0.014	892.05	890.3	Circular	1
12" 45_PO	45_PO	45_5	269	0.013	831	829.52	Circular	1
12" 4_44	4_44	44_4A	163	0.013	831.3	830	Circular	1
12" 47_PO	47_PO	47_5	273	0.013	831.17	829.37	Circular	1
12" 48_3	48_3	48_CL	332	0.013	848.21	844.93	Circular	1
12" 48_4	48_4	48_4 A	93	0.013	835.27	832.54	Circular	1
12" 48_CL	48_CL	48_4	326	0.013	844.93	835.27	Circular	1
12" 48_POA	48_PO A	48_PO	70	0.013	826.35	825.75	Circular	1
12" 49_PLM	49_PL MID	49_WE	293	0.013	892.85	892.55	Circular	1
12" 49_WE.	49_WE	49_WE MID	312.1	0.013	891.3	889.3	Circular	1
12" 49_WEM	49_WE MID	49_NI	364.4	0.013	889.3	878.66	Circular	1
12" 50_1	50_1	50_ST	291.5	0.013	908.22	884.65	Circular	1
12" 50_BE	50_BE	50_NI	305.9	0.013	909.9	897.25	Circular	1
12" 50_NI	50_NI	50_NI A	53	0.013	897.14	896.1	Circular	1
12" 50_ST	50_ST	50_ST A	51	0.013	884.65	882.92	Circular	1
12" 51_ST	51_ST	50_ST A	511	0.013	888.43	883.06	Circular	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
12" BE_50	BE_50	50_BE	43.5	0.013	912.33	909.9	Circular	1
12" BE_61	BE_61	BE_50	514.6	0.013	916	912.33	Circular	1
12" EAST	N509	N510	21	0.013	866.8	866.8	Circular	1
12" NI_RU	NI_RU	48_NI	222	0.013	866.2	860.9	Circular	1
12" RU.1	RU	RU_WE	173.2	0.013	886.62	885.68	Circular	1
12" RU_WE	RU_WE	48_WE	382.8	0.013	885.54	874.83	Circular	1
12" WE_RU	WE_RU	RU_WE	91.6	0.013	889.64	888.05	Circular	1
12" WEST	N509	N510	21	0.013	866.8	866.8	Circular	1
15 43_PI	U23733-2	U23515	105	0.013	859.37	858.84	Circular	1.25
15" 44_POA	44_POA	44_PO	68	0.013	829.7	829.49	Circular	1.25
15" 48_4A	48_4 A	48_5	274.5	0.013	830.64	826.35	Circular	1.25
15" 48_BL	48_BL	48_BL MID	189	0.013	860.8	860	Circular	1.25
15" 48_BLM	48_BL MID	48_NI	171.8	0.013	860	859.27	Circular	1.25
15" 48_WE	48_WE	48_BL	304	0.013	873.3	860.8	Circular	1.25
15" 49_1.1	49_1	49_ST	329.3	0.013	854.8	840.8	Circular	1.25
15" 49_NI	49_NI	49_1	308.8	0.013	878.66	854.8	Circular	1.25
15" 49_ST.	49_ST	49_ST A	26.7	0.013	840.8	839.04	Circular	1.25
15" 50_NIA	50_NI A	49_NI	488	0.013	896.1	881.18	Circular	1.25
15" 50_STA	50_ST A	50_ST B	186	0.013	881.87	871.12	Circular	1.25
15" 50_STB	50_ST B	ST_49 F	209	0.013	870.63	857.12	Circular	1.25
15" ST_49F	ST_49 F	49_ST E	206	0.013	856.26	843.46	Circular	1.25
18 42_PL	42_PL ALL	T22803	187	0.013	870.58	870.09	Circular	1.5
18" 46_PO	46_PO	46_PO A	62	0.013	830.32	829.65	Circular	1.5
18" 48_1	48_1	48_ST	290.1	0.013	856.3	850.8	Circular	1.5
18" 48_NI	48_NI	48_NIA	85.5	0.013	859.27	857.3	Circular	1.5
18" 48_NIA	48_NIA	48_1	287.2	0.013	857.3	856.3	Circular	1.5
18" 49_STE	49_ST E	49_ST A	35	0.013	842.67	840.67	Circular	1.5
18" N510	N510	T23544	12	0.013	872	871.98	Circular	1.5
21" 43_PO	43_PO	43_5	248.8	0.013	831.2	830.18	Circular	1.75
21" 44_2	44_2	44_3 MID	179.8	0.013	835.3	833.53	Circular	1.75
21" 44_3	44_3	44_3A	43	0.013	832.5	831.2	Circular	1.75
21" 44_3M	44_3 MID	44_3	123.1	0.013	833.53	832.5	Circular	1.75
21" 48_5M	48_5 MID	48_5	139.6	0.013	825.8	825.33	Circular	1.75
21" 48_PO	48_PO	48_5 MID	123.1	0.013	826.32	825.8	Circular	1.75
21" 48_ST	48_ST	ST_RU	365	0.013	850.8	844.3	Circular	1.75
21" 49_STB	49_ST B	49_ST A	24	0.013	839.3	839.04	Circular	1.75
21" 49_STC	49_ST C	49_ST B	24	0.013	840.7	839.3	Circular	1.75
21" ST_RU	ST_RU	49_ST C	268.4	0.013	844.3	840.7	Circular	1.75
24 46_LY	46_LY ALL	U25405	301	0.014	868.75	867.85	Circular	1
24" 44_3A	44_3A	44_CL	313.8	0.013	831.2	830.3	Circular	2
24" 44_BL	44_BL ALL	U24201	277	0.014	847.88	846.5	Circular	2
24" 44_PO	44_PO	44_5A	282	0.013	829.33	828.87	Circular	2
27" 44_CL	44_CL	44CL_MID	160.5	0.013	830.3	830.06	Circular	2.25
27" 44CL_M	44CL_MID	44_4	140.5	0.013	830.06	829.9	Circular	2.25

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
27" 45_2	45_2	45_3	240	0.013	836.52	831.8	Circular	2.25
27" 45_3	45_3	45_3 A	40	0.013	831.8	831.6	Circular	2.25
27" 45_3A	45_3 A	45_3B	8.5	0.013	831.6	831.21	Circular	2.25
27" 46_2A	46_2 A	46_2 MID	126	0.013	832.93	832.05	Circular	2.25
27" 46_2M	46_2 MID	46_MID A	45	0.013	832.05	831.72	Circular	2.25
27" 46_MA	46_MID A	46_3	83	0.013	831.72	831.1	Circular	2.25
30" 43_2	43_2	43_3	288.9	0.013	833.2	832.3	Circular	2.5
30" 43_3	43_3	43_CL	354.6	0.013	832.3	831.3	Circular	2.5
30" 44_4	44_4	44_4A	40.2	0.013	829.9	829.79	Circular	2.5
30" 44_4A	44_4A	44_5 B	310.4	0.013	829.79	828.9	Circular	2.5
30" 44_5 B	44_5 B	44_5A	16	0.013	828.9	828.33	Circular	2.5
30" 45_3B	45_3B	45_3 C	13	0.013	831.21	830.61	Circular	2.5
30" 45_3C	45_3 C	45_3 MID	149.9	0.013	830.61	830.18	Circular	2.5
30" 45_3M	45_3 MID	45_CL	142.3	0.013	830.18	829.8	Circular	2.5
30" 45_CL	45_CL	45_CL A	31.9	0.013	829.8	829.67	Circular	2.5
30" 45_CLA	45_CL A	45_4	350.1	0.013	829.67	828.3	Circular	2.5
30" 46_3	46_3	46_3A	77.8	0.013	831.1	830.49	Circular	2.5
30" 46_3A	46_3A	46_CL	281.1	0.013	830.49	828.3	Circular	2.5
30" 46_POA	46_PO A	46_5A	295	0.013	829.65	826.3	Circular	2.5
30" 49_2	49_2	49_2 MID	188.1	0.013	837	835.58	Circular	2.5
30" 49_2M	49_2 MID	49_3	130.7	0.013	835.58	834.6	Circular	2.5
30" 49_3	49_3	49_3 A	69.3	0.013	834.6	834.25	Circular	2.5
30" 49_3A	49_3 A	49_CL	278	0.013	834.25	825.3	Circular	2.5
33" 43_4	43_4	43_5	370.7	0.013	830.3	829.05	Circular	2.75
33" 43_CL	43_CL	43_4	329	0.013	831.3	830.3	Circular	2.75
33" 45_4	45_4	45_5	313.9	0.013	828.3	827.3	Circular	2.75
33" 46_4	46_4	46_4 A	39	0.013	827.9	827.57	Circular	2.75
33" 46_CL	46_CL	46_CL A	31.5	0.013	828.3	828.26	Circular	2.75
33" 46_CLA	46_CL A	46_4	294.3	0.013	828.26	827.9	Circular	2.75
33" 49_4	49_4	49_4 A	31.1	0.013	823.8	823.71	Circular	2.75
33" 49_CL	49_CL	49_4	326.6	0.013	825.3	823.8	Circular	2.75
35W100.1	46TH-10	46TH-9	240	0.014	840.05	838.88	Circular	3
35W100.2	46TH-10	46TH-9	240	0.015	847.55	846.35	Natural	0.5
35W101.1	46TH-9	C5400	195	0.014	838.33	837.38	Circular	3
35W101.2	46TH-9	C5400	195	0.015	846.35	845.53	Natural	0.5
35W102.1	C5400	B5339	50	0.014	837.41	837.13	Circular	3
35W102.2	C5400	B5339	50	0.015	845.53	845.28	Natural	0.5
35W103.1	B5339	46TH-8	129	0.014	837.01	836.39	Circular	3
35W103.2	B5339	46TH-8	129	0.015	845.28	844.56	Natural	0.5
35W104.1	46TH-8	B5401	31	0.014	835.63	835.5	Circular	3.5
35W104.2	46TH-8	B5401	31	0.015	844.56	844.36	Natural	0.5
35W105.1	B5401	B5352	25	0.014	835.48	835.38	Circular	3.5
35W105.2	B5401	B5352	25	0.015	844.36	844.19	Natural	0.5
35W106.1	B5352	C5402	70	0.014	835.25	834.93	Circular	3.5

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
35W106.2	B5352	C5402	70	0.015	844.19	843.65	Natural	0.5
35W107.1	C5402	B5353	30	0.014	834.9	834.78	Circular	3.5
35W107.2	C5402	B5353	30	0.015	843.65	843.52	Natural	0.5
35W108.1	B5353	B5358	90	0.014	834.65	834.23	Circular	3.5
35W108.2	B5353	B5358	90	0.015	843.52	842.92	Natural	0.5
35W109.1	B5358	C5403	55	0.014	834.1	833.85	Circular	3.5
35W109.2	B5358	C5403	55	0.015	842.92	842.57	Natural	0.5
35W110.1	C5403	B5359	25	0.014	833.83	833.73	Circular	3.5
35W110.2	C5403	B5359	25	0.015	842.57	842.57	Natural	0.5
35W111.1	B5359	B5360	58	0.014	833.6	833.34	Circular	3.5
35W111.2	B5359	B5360	58	0.015	842.57	842.61	Natural	0.5
35W112.1	B5360	46TH-7	69	0.014	833.21	832.89	Circular	3.5
35W112.2	B5360	46TH-7	69	0.015	842.61	842.05	Natural	0.5
35W113.1	46TH-7	46TH-6	166	0.014	832.77	831.95	Circular	3.5
35W113.2	46TH-7	46TH-6	166	0.015	842.05	840.37	Natural	0.5
35W114.1	46TH-6	B5407	223	0.014	824.74	823.88	Circular	4
35W114.2	46TH-6	B5407	223	0.015	840.37	837.16	Natural	0.5
35W115.1	B5407	46TH-5	224	0.014	823.75	822.88	Circular	4
35W115.2	B5407	46TH-5	224	0.015	837.16	833.14	Natural	0.5
35W116.1	46TH-5	46TH-4	210	0.014	822.76	821.94	Circular	4
35W116.2	46TH-5	46TH-4	210	0.015	833.14	830.44	Natural	0.5
35W117.1	46TH-4	46TH-3	190	0.014	821.46	820.73	Circular	4
35W117.2	46TH-4	46TH-3	190	0.015	830.44	829.12	Natural	0.5
35W118.1	46TH-3	B5417	139	0.014	820.58	820.03	Circular	4
35W118.2	46TH-3	B5417	139	0.015	829.12	828.83	Natural	0.5
35W119.1	B5417	B5439	30	0.014	819.51	819.43	Circular	4.5
35W119.2	B5417	B5439	30	0.015	828.83	828.84	Natural	0.5
35W120.1	B5439	46TH-2	59	0.014	819.3	819.09	Circular	4.5
35W120.2	B5439	46TH-2	59	0.015	828.84	828.93	Natural	0.5
35W121.1	46TH-2	B5474	110	0.014	818.56	818.21	Circular	5
35W121.2	46TH-2	B5474	110	0.015	828.93	829.32	Natural	0.5
35W122.1	B5474	B5565	105	0.014	818.17	817.84	Circular	5
35W122.2	B5474	B5565	10	0.014	0.05	0	Circular	0.05
35W200.1	46TH-14	46TH-13	388	0.014	848.14	846.17	Circular	2
35W200.2	46TH-14	46TH-13	388	0.015	854.48	851.46	Natural	0.5
35W201.1	46TH-13	46TH-12	292	0.014	845.45	844.01	Circular	2.25
35W201.2	46TH-13	46TH-12	215	0.015	851.46	849.78	Natural	0.5
35W202.1	46TH-12	46TH-11	215	0.014	843.15	842.31	Circular	3
35W202.2	46TH-12	46TH-11	215	0.015	849.78	848.7	Natural	0.5
35W203.1	46TH-11	46TH-10	230	0.014	842.19	841.29	Circular	3
35W203.2	46TH-11	46TH-10	230	0.015	848.7	847.55	Natural	0.5
35W204.1	46TH-1	B5472	287	0.014	824.2	822.8	Circular	2
35W204.2	46TH-1	B5472	287	0.015	831.12	829.14	Natural	0.5
35W205.1	B5472	46TH-2	60	0.015	821.35	821.09	Circular	2.5

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
35W205.2	B5472	46TH-2	60	0.015	829.14	828.93	Natural	0.5
35W206.1	B5496	B5501	247	0.014	825.46	824.25	Circular	1.75
35W206.2	B5496	B5501	247	0.015	832.53	830.24	Natural	0.5
35W207.1	B5501	C5427	230	0.014	823.61	821.74	Circular	2
35W207.2	B5501	C5427	230	0.015	830.24	827.4	Natural	0.5
35W208.1	C5427	C5428	10	0.014	821.6	821.56	Circular	2
35W208.2	C5427	C5428	10	0.015	827.4	827.28	Natural	0.5
35W209.1	C5428	C5429	100	0.014	821.27	820.5	Circular	2.25
35W209.2	C5428	C5429	100	0.015	827.28	825.83	Natural	0.5
36" 46_4A	46_4 A	46_4 B	17	0.013	827.57	827.42	Circular	3
36" 46_4B	46_4 B	46_MID	139	0.013	827.42	826.92	Circular	3
36" 46_M	46_MID	46_5A	173	0.013	826.92	826.3	Circular	3
36" 47_2	47_2	47_3	309.9	0.013	837.3	836.55	Circular	3
36" 47_3	47_3	47_CL	350.3	0.013	836.55	831.5	Circular	3
36" 47_4	47_4	47_4 A	24	0.013	828.78	827.95	Circular	3
36" 47_4A	47_4 A	47_4 B	32	0.013	827.95	828.17	Circular	3
36" 47_4B	47_4 B	47_5	328.8	0.013	828.169	825.5	Circular	3
36" 47_CL	47_CL	47_CL A	31.3	0.013	831.5	831.2	Circular	3
36" 47_CLA	47_CL A	47_4	277.58	0.013	831.2	828.78	Circular	3
36" 49_4A	49_4 A	49_5	332.4	0.013	823.71	822.7	Circular	3
42" 43_5	43_5	43_5A	11.3	0.013	829.05	829.03	Circular	3.5
42" 44_5	44_5	44_5A	39.8	0.013	828.1	828.04	Circular	3.5
42" 44_5A	44_5A	45_5	651.1	0.013	828.04	827.12	Circular	3.5
42" 5_43AD	43_5A	44_5	627.2	0.013	829.03	828.1	Circular	3.5
4-24-25-St	25-4th	24-4th	671	0.015	871.3	867.3	Natural	1
47TH_TRAP	U25857	B5561	300	0.015	859.18	839.75	Natural	0.5
48" 45_5	45_5	46_5	626.4	0.013	827.12	826.24	Circular	4
48" 46_5	46_5	46_5A	40.7	0.013	826.235	826.18	Circular	4
48" 46_5A	46_5A	5_46 MID	409.6	0.013	826.18	825.59	Circular	4
48" 5_46M	5_46 MID	47_5	200.2	0.013	825.59	825.3	Circular	4
54" 47_5	47_5	48_5	650.5	0.013	825.3	824.3	Circular	4.5
54" 48_5	48_5	49_5	657.2	0.013	824.3	822.7	Circular	4.5
57" 49_5	49_5	5_CRK	558.6	0.013	822.7	821.3	Circular	4.75
5th-24-25.	24-5th	25-5th	683.26	0.015	866.64	861.3	Natural	1
6" 50_BE	50_BE	U27577	861	0.016	916.8	909.5	Natural	0.5
9" 44_BL	44_BL ALL	44_BL ALL2	146.4	0.014	846.3	845.3	Circular	0.75
9" 44_WE	44_WE ALL	U23765	43.5	0.013	847.3	846.8	Circular	0.75
9" 45_PL2	45_PL ALL2	U24885	14.5	0.015	0	877.3	Natural	1
9" 48_BL	48_BL ALL	48_BL ALL2	124.3	0.013	855.8	855.3	Circular	0.75
9" 49_5M	49_5 MID	49_5	144	0.013	824.7	824.1	Circular	0.75
9"44_BL A	44_BL ALL2	44_BL ALL3	25.5	0.014	845.3	841.43	Circular	0.75
BLVD 4_PO	43_PO	OAK OUT7	265	0.1	837	834	Natural	0.5
BLVD 43_3	43_3	43_CL	354.6	0.1	838	839	Natural	0.5
BLVD 43_4	43_4	43_5	370.7	0.1	839	838	Natural	0.5

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
BLVD 43_5	43_5	43_5A	11.3	0.1	838	838	Natural	0.5
BLVD 43_CL	43_CL	43_4	329	0.1	839	839	Natural	0.5
BLVD 43_PO	43_PO	43_5	248.8	0.1	837	838	Natural	0.5
BLVD 44_2	44_2	44_3 MID	179.8	0.1	842.3	839.93	Natural	0.5
BLVD 44_3	44_3	44_3A	43	0.1	838	838	Natural	0.5
BLVD 44_3A	44_3A	44_CL	313.8	0.1	838	837.39	Natural	0.5
BLVD 44_4	44_4	44_4A	40.2	0.1	836.42	836.3	Natural	0.5
BLVD 44_4A	44_4A	44_5 B	310.4	0.1	836.3	835	Natural	0.5
BLVD 44_5	44_5	44_5A	39.8	0.1	835	835	Natural	0.75
BLVD 44_5A	44_5A	45_5	651.1	0.1	835	836.3	Natural	0.5
BLVD 44_CL	44_CL	44CL_MID	160.5	0.1	837.39	836.83	Natural	0.5
BLVD 44_PO	44_PO	44_5A	282	0.1	833.37	835	Natural	0.75
BLVD 45_4	45_4	45_5	313.9	0.1	837.3	836.3	Natural	0.5
BLVD 45_5	45_5	46_5	626.4	0.1	836.3	834	Natural	0.5
BLVD 45_CL	45_CL	45_CL A	31.9	0.1	836.3	836.3	Natural	0.5
BLVD 46_3	46_3	46_3A	77.8	0.1	836.3	836.3	Natural	0.5
BLVD 46_3A	46_3A	46_CL	281.1	0.1	836.3	834	Natural	0.5
BLVD 46_4	46_4	46_4 A	39	0.1	835	835	Natural	0.5
BLVD 46_M	46_MID	46_5A	173	0.1	834.5	834	Natural	0.5
BLVD 46_PO	46_PO	OAK OUT4	307	0.1	833.8	833	Natural	1
BLVD 48_1	48_1	48_ST	290.1	0.1	871.3	858.3	Natural	0.5
BLVD 48_5	48_5	49_5	657.2	0.1	832.3	830	Natural	0.5
BLVD 48_5M	48_5 MID	48_5	139.6	0.1	831.88	832.3	Natural	0.5
BLVD 48_BL	48_BL	48_BL MID	189	0.1	867.3	866.8	Natural	0.5
BLVD 48_PO	48_PO A	OAK OUT2	332	0.1	831.3	830	Natural	0.5
BLVD 48_WE	48_WE	48_BL	304	0.1	880.8	867.3	Natural	0.5
BLVD 48-NI	48_NI	48_NIA	85.5	0.1	866.3	866.3	Natural	0.5
BLVD 49_1.	49_1	49_ST	329.3	0.1	861.3	847	Natural	0.75
BLVD 49_4	49_4	49_4 A	31.1	0.1	829	829	Natural	0.75
BLVD 49_5	49_5	5_CRK	558.6	0.1	830	829.4	Natural	0.5
BLVD 49_5M	49_5 MID	49_5	144.6	0.1	829	830	Natural	0.75
BLVD 49_NI	49_NI	49_1	308.8	0.1	887.06	861.3	Natural	0.5
BLVD 49_ST	49_ST	49_ST A	26.7	0.1	847	847	Natural	0.75
BLVD 50_BE	50_BE	50_NI	305.9	0.1	917.3	904.34	Natural	0.5
BLVD 50_NI	50_NI	50_NI A	53	0.1	904.34	902.04	Natural	0.5
BLVD BE_50	BE_50	50_BE	43.5	0.1	917.3	917.3	Natural	0.5
BLVD BE_61	BE_61	BE_50	514.6	0.1	920.3	917.3	Natural	0.5
BLVD R53	R53	R58	345	0.1	857.3	840	Natural	0.5
BLVD43_2	43_2	43_3	288.9	0.1	839	838	Natural	0.5
BLVD43_3	43_3	44_3	666	0.1	838	838	Natural	0.5
BLVD44_3 M	44_3 MID	44_3	123.1	0.1	839.93	838	Natural	0.5
BLVD44_5 B	44_5 B	44_5A	16	0.1	835	835	Natural	0.75
BLVD44_CL	44_CL	45_CL	664	0.1	837.39	836.3	Natural	0.5
BLVD44_PO	44_POA	OAK OUT6	323	0.1	833	831	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
BLVD44_POA	44_POA	44_PO	68	0.1	833	833.37	Natural	1
BLVD44CL_M	44CL_MID	44_4	140.5	0.1	836.83	836.42	Natural	0.5
BLVD45_CL	45_CL	46_CL	655	0.1	836.3	834	Natural	0.5
BLVD45_CLA	45_CL A	45_4	350.1	0.1	836.3	837.3	Natural	0.5
BLVD46_4A	46_4 A	46_4 B	17	0.1	835	835	Natural	0.5
BLVD46_4B	46_4 B	46_MID	139	0.1	835	834.5	Natural	0.5
BLVD46_5	46_5	46_5A	40.7	0.1	833.5	833.5	Natural	0.5
BLVD46_CL	46_CL	46_CL A	31.5	0.1	834	834	Natural	0.5
BLVD46_CLA	46_CL A	46_4	294.3	0.1	834	835	Natural	0.5
BLVD46_PO	46_PO	46_PO A	62	0.1	833.8	834	Natural	0.5
BLVD46_POA	46_PO A	46_5A	295	0.1	834	834	Natural	0.5
BLVD48_BLM	48_BL MID	48_NI	171.8	0.1	866.8	866.3	Natural	0.5
BLVD48_NIA	48_NIA	48_1	287.2	0.1	866.3	871.3	Natural	0.5
BLVD48_PO	48_PO	48_5 MID	123.1	0.1	831.3	831.88	Natural	0.5
BLVD48_POA	48_PO A	48_PO	70	0.1	831.3	831.3	Natural	0.5
BLVD49_5MI	49_5 MID	OAK OUT1	186.5	0.1	829	828	Natural	0.75
BLVD49_STB	49_ST B	49_ST A	24	0.1	847	847	Natural	0.75
BLVD49_STE	49_ST E	49_ST A	35	0.1	847	847	Natural	0.75
BLVD5_43AD	43_5A	44_5	627.2	0.1	838	835	Natural	0.5
BLVD50_NIA	50_NI A	49_NI	488	0.1	902.04	887.06	Natural	0.5
BLVDST_49F	ST_49 F	49_ST E	206	0.1	862	847	Natural	0.75
BVLD 48_NI	48_NI	U25895	707	0.1	866.3	866.1	Natural	0.5
BVLD 49_2	49_2	49_2 MID	188.1	0.1	846.3	845	Natural	0.5
BVLD 49_3	49_3	49_3 A	69.3	0.1	844.3	844.3	Natural	0.5
BVLD 49_CL	49_CL	49_4	326.6	0.1	833	829	Natural	0.75
BVLD49_2M	49_2 MID	49_3	130.7	0.1	845	844.3	Natural	0.5
BVLD49_3A	49_3 A	49_CL	278	0.1	844.3	833	Natural	0.5
BVLD49_4A	49_4 A	49_5	332.4	0.1	829	830	Natural	0.75
L100-1	28-Bla	28-Nic-2	398	0.014	865.52	864.2	Circular	1.75
L100-2	28-Bla	28-Nic-2	398	0.015	872.3	871.3	Natural	1
L101-1	29-Nic-2	29-Nic	52.4	0.014	866.5	866.3	Circular	1.75
L101-2	29-Nic-2	29-Nic	52.4	0.015	872.1	872	Natural	1
L102-1	N105	29-Nic-2	362.2	0.014	867.6	866.5	Circular	1.75
L102-2	N105	29-Nic-2	362.2	0.015	873.3	872	Natural	1
L103-1	29-Bla	N105	71.1	0.014	867.76	867.6	Circular	1.75
L103-2	29-Bla	N105	71.1	0.015	873.3	873.3	Natural	1
L104-1	29-Pils	29-Bla	396.2	0.014	869	867.76	Circular	1.5
L104-2	29-Pils	29-Bla	396.2	0.015	875.04	873.3	Natural	1
L105-1	29-pils-2	29-Pils	43	0.014	869.09	869	Circular	1.5
L105-2	29-pils-2	29-Pils	43	0.015	874.97	875.04	Natural	1
L106-1	29-Pleas	29-pils-2	368.5	0.014	870.92	869.23	Circular	1
L106-2	29-Pleas	29-pils-2	368.5	0.015	876.12	874.97	Natural	1
L107-1	29-5th-3	29-5th	37.5	0.014	843.74	843.35	Circular	1
L107-2	29-5th-3	29-5th	37.5	0.015	848.1	847.8	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
L108-1	29-5th-2	29-5th	39.5	0.014	841.02	840.44	Circular	2.5
L108-2	29-5th-2	29-5th	39.5	0.015	848.1	847.8	Natural	1
L109-1	29-HncAdd	29-5th-2	155.1	0.014	842.24	841.02	Circular	2.5
L109-2	29-HncAdd	29-5th-2	155.1	0.015	849.1	848.1	Natural	1
L1-1	24-Nic	24-1st	287	0.014	886.39	884.36	Circular	1.25
L1-1.1	R1	R7	80	0.014	855.55	853.5	Circular	0.75
L110-1	29-4th	29-HncAdd	179.4	0.014	844.69	842.24	Circular	2.5
L110-2	29-4th	29-HncAdd	179.4	0.015	850.3	849.1	Natural	1
L11-1	N22	24-3rd	315.6	0.014	880.36	879.89	Circular	2
L111-1	29-Clin	29-4th	281.4	0.014	852.89	845.42	Circular	2
L111-2	29-Clin	29-4th	281.4	0.015	868.34	850.3	Natural	1
L11-2	N22	24-3rd	315.6	0.015	887.8	887.35	Natural	1
L112-1	N115	29-Clin	19	0.014	853.02	852.89	Circular	2.5
L112-2	N115	29-Clin	19	0.015	866.8	868.34	Natural	1
L113-1	29-Dues	29-Clin	181.5	0.014	857.79	854.49	Circular	1
L113-2	29-Dues	29-Clin	181.5	0.015	866	868.34	Natural	1
L114-1	29-3rd	29-Dues	144.8	0.014	860.86	859.64	Circular	1
L114-2	29-3rd	29-Dues	144.8	0.015	867.3	866	Natural	1
L115-1	29-BouAdd	29-3rd	170.4	0.014	861.82	860.86	Circular	1
L115-2	29-BouAdd	29-3rd	170.4	0.015	865.7	867.3	Natural	1
L116-1	29-2nd	29-BouAdd	147.6	0.014	862.38	861.82	Circular	1
L116-2	29-2nd	29-BouAdd	147.6	0.015	867.82	865.7	Natural	1
L118-1	29-Port	29-5th-3	267	0.014	856.56	843.74	Circular	1
L118-2	29-Port	29-5th-3	267	0.015	866.12	848.1	Natural	1
L1-2	24-Nic	24-1st	287	0.015	893.3	890.5	Natural	1
L1-2.2	R1	R7	80	0.015	859.55	862.86	Natural	0.5
L12-1	N23	N24	58.6	0.014	876.34	875.31	Circular	2
L12-2	N23	N24	58.6	0.015	887.25	886.22	Natural	1
L124-1	Lake-Clin3	Lake-Clin	40	0.014	855.65	855.41	Circular	1.5
L124-2	Lake-Clin3	Lake-Clin	40	0.015	861.61	861.3	Natural	1
L125-1	Lake-Clin2	Lake-Clin	41	0.014	855.43	855.27	Circular	1.75
L125-2	Lake-Clin2	Lake-Clin	41	0.015	862.12	861.3	Natural	1
L126-1	N131	N115	215	0.014	853.95	853.02	Circular	2.5
L126-2	N131	N115	215	0.015	860.87	866.8	Natural	1
L127-1	Lake-Clin	N131	411	0.014	855.27	853.95	Circular	2.5
L127-2	Lake-Clin	N131	411	0.015	861.3	860.87	Natural	1
L128-1	Lake-4th	N132	35	0.014	859.51	858.74	Circular	1.5
L128-2	Lake-4th	N132	35	0.015	864.98	864.8	Natural	1
L129-1	N132	Lake-Clin3	242.5	0.014	858.74	855.65	Circular	1.5
L129-2	N132	Lake-Clin3	242.5	0.015	864.8	861.61	Natural	1
L130-1	Lake-3rd	Lake-Clin2	226	0.014	856.64	856.04	Circular	1.75
L130-2	Lake-3rd	Lake-Clin2	226	0.015	864.81	862.12	Natural	1
L13-1	N24	24-Clin	209	0.014	875.31	862.67	Circular	2
L131-1	Lake-3rd-2	Lake-3rd	104	0.014	859.31	858.92	Circular	1.5

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
L131-2	Lake-3rd-2	Lake-3rd	104	0.015	865.21	864.81	Natural	1
L13-2	N24	24-Clin	209	0.015	886.22	869.3	Natural	1
L132-1	Lake-2nd	Lake-3rd-2	256.5	0.014	860.37	859.49	Circular	1.5
L132-2	Lake-2nd	Lake-3rd-2	256.5	0.015	865.47	865.21	Natural	1
L133-1	Lake-4th-2	Lake-4th	74	0.014	859.91	859.51	Circular	1
L133-2	Lake-4th-2	Lake-4th	74	0.015	864.46	864.98	Natural	1
L135-1	N170	27-35W	187	0.014	843	841.07	Circular	3
L135-2	N170	27-35W	187	0.015	850.31	851.35	Natural	1
L136-1	29-35W	28-35W	400	0.014	866.05	853.69	Circular	1
L136-2	29-35W	28-35W	400	0.015	871.701	855.95	Natural	1
L137-1	26-1st	26-Stev	337	0.014	863.55	862.42	Circular	2.75
L137-2	26-1st	26-Stev	337	0.015	871.3	870.3	Natural	1
L14-1	24-4th	N25	35	0.014	857.3	857.1	Circular	2.25
L14-2	24-4th	N25	35	0.015	867.3	867.3	Natural	1
L150-1	MH76	24/25-35WB	163	0.014	841.46	839.57	Circular	2.5
L150-2	MH76	24/25-35WB	163	0.015	852.903	854.27	Natural	1
L15-1	N25	24-35W_1	95	0.014	856	849.05	Circular	2
L15-2	N25	24-35W_1	95	0.015	867.3	852.4	Natural	1
L157-1	25-35W	26-35W	813	0.014	839.54	835.2	Circular	5
L157-2	25-35W	26-35W	813	0.015	854.261	852.67	Natural	1
L158-1	28-35W	N169	362	0.014	853.19	845.15	Circular	1.5
L158-2	28-35W	N169	362	0.015	855.953	850.65	Natural	1
L159-1	N169	N170	275	0.014	844.4	843	Circular	3
L159-2	N169	N170	275	0.015	850.65	850.31	Natural	1
L1680	N2075	N2076	32	0.014	872.23	872.14	Circular	2.5
L1681	N2076	T20551	265	0.014	872.14	871.4	Circular	2
L17	22-35W	NPondIn	179	0.014	849.22	846.58	Circular	2.25
L18-1	24-35W_1	CB78	122	0.014	840.34	840.1	Circular	4
L18-2	24-35W_1	CB78	122	0.015	852.4	852.72	Natural	1
L19-1	24-Port-2	24-5th	256	0.014	858.41	857.15	Circular	1.5
L19-2	24-Port-2	24-5th	256	0.015	865.43	866.64	Natural	1
L20-1	24-5th	MH82	42	0.014	856.96	854.87	Circular	1.5
L20-2	24-5th	MH82	42	0.015	866.64	866.48	Natural	1
L21-1	MH82	MH80	112	0.014	853.58	848.31	Circular	1.5
L21-2	MH82	MH80	112	0.015	866.48	852.74	Natural	1
L22-1	MH80	MH76	144	0.014	842.83	841.46	Circular	2
L22-2	MH80	MH76	144	0.015	852.744	852.9	Natural	1
L23-1	CB78	24/25-35WB	260	0.014	840.096	839.58	Circular	4
L23-2	CB78	24/25-35WB	260	0.015	852.722	854.27	Natural	1
L232-1	232-0	DS2(35th)	320	0.014	837.8	831.7	Circular	3.5
L232-2	232-0	DS2(35th)	320	0.014	844.8	839.6	Natural	1
L24-1	25-Nic	25-1st	276.8	0.014	875.75	873.99	Circular	1.25
L24-2	25-Nic	25-1st	276.8	0.015	882.5	882.4	Natural	1
L25-1	25-1st	25-1st_2	33.5	0.014	873.99	873.44	Circular	1.5

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
L25-2	25-1st	25-1st_2	33.5	0.015	882.5	882.4	Natural	1
L25863-3O	U25863	48_ST	631.7	0.016	859.3	857.3	Natural	1
L26-1	25-1st_2	25-Stev	321.1	0.014	873.44	872.2	Circular	2.25
L26-2	25-1st_2	25-Stev	321.1	0.015	882.4	882.3	Natural	1
L27-1	25-Stev	25-ArtIn	318.6	0.014	872.1	871.33	Circular	2.5
L27-2	25-Stev	25-ArtIn	318.6	0.015	882.3	879.3	Natural	1
L28-1	25-ArtIn	25-3rd	313.9	0.014	871.33	869.47	Circular	2.75
L28-2	25-ArtIn	25-3rd	313.9	0.015	879.3	875.8	Natural	1
L29-1	25-3rd	25-3rd-2	34	0.014	869.47	868.65	Circular	3
L29-2	25-3rd	25-3rd-2	34	0.015	875.9	875.8	Natural	1
L30-1	25-3rd-2	25-Clin	296.3	0.014	868.65	867.19	Circular	3
L30-2	25-3rd-2	25-Clin	296.3	0.015	875.8	873.8	Natural	1
L3-1	24-1st	24-Stev	338.4	0.014	884.36	881.99	Circular	1.5
L31-1	25-Clin	25-4th	317.7	0.014	867.19	865.2	Circular	3
L31-2	25-Clin	25-4th	317.7	0.015	873.8	871.3	Natural	1
L3-2	24-1st	24-Stev	338.4	0.015	890.5	888.45	Natural	1
L32-1	25-4th	25-4th-2	30	0.014	865.2	865.01	Circular	3
L32-2	25-4th	25-4th-2	30	0.015	871.3	871.3	Natural	1
l350-0	235-0	232-0	300	0.014	850.7	844.8	Natural	1
L35-1	25-4th-2	25-35W	180	0.014	845.42	840.54	Circular	2.5
L35-2	25-4th-2	25-35W	180	0.015	871.3	854.26	Natural	1
L359-3	26-Bla	27-Bla	667.52	0.015	871.8	870.15	Natural	0.5
L36-1	25-5th	25-35W	100	0.014	842.7	840.54	Circular	2
L36-2	25-5th	25-35W	100	0.015	861.3	854.26	Natural	1
L37-1	25-Port-2	25-5th	325	0.014	856.64	854.72	Circular	2.5
L37-2	25-Port-2	25-5th	325	0.015	862.3	861.3	Natural	1
L38-1	25-Port	25-Port-2	52	0.014	857.62	856.64	Circular	2.5
L38-2	25-Port	25-Port-2	52	0.015	862.3	862.3	Natural	1
L39-1	25-Oak	25-Port	308.3	0.014	858.46	857.62	Circular	1.75
L39-2	25-Oak	25-Port	308.3	0.015	864.3	862.3	Natural	1
L398	U23442-2	U24176	97.5	0.013	848.3	847.8	Circular	0.75
L40-1	24/25-35WB	25-35W	390	0.014	839.57	838.79	Circular	4
L40-2	24/25-35WB	25-35W	390	0.015	854.273	854.26	Natural	1
L408.1	49_ST A	49_2	303.7	0.013	839.04	837	Circular	2.5
L40TH-1	40TH	DS1(39th)	610	0.014	804.55	802.72	Circular	6.5
L40TH-2	40TH	DS1(39th)	610	0.015	832.2	837.6	Natural	1
L4-1	24-Stev	N22	322	0.014	881.99	880.36	Circular	2
L41-1	26-35W	27-35W	634	0.014	835.2	830.39	Circular	5
L41-2	26-35W	27-35W	634	0.015	852.665	851.35	Natural	1
L4-2	24-Stev	N22	322	0.015	888.45	887.8	Natural	1
L42ND-1.1	42ND	40TH	1210	0.014	808.68	805.05	Circular	6.5
L42ND-2.1	42ND	40TH	1210	0.015	821.23	832.2	Natural	0.5
L43-1	26-Bla	26-Nic	426.25	0.014	866.3	865.4	Circular	2.5
L43-2	26-Bla	26-Nic	426.25	0.015	871.3	872.3	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
L43RD-1-1	B5573	43RD-2	50	0.014	808.06	807.92	Circular	10
L43RD-1-2	B5573	43RD-2	50	0.015	826.18	824.67	Natural	0.5
L43RD-2-1	43RD-2	43RD-3	165	0.014	811.93	811.69	Circular	6
L43RD-2-2	43RD-2	43RD-3	165	0.015	824.67	824.67	Natural	0.5
L43RD-3-1	43RD-3	42ND	515	0.014	811.68	810.18	Circular	6
L43RD-3-2	43RD-3	42ND	378	0.015	824.67	821.5	Natural	0.5
L44-1	26-Nic	26-Nic-2	36	0.014	865.4	864.33	Circular	2.5
L44-2	26-Nic	26-Nic-2	36	0.015	872.3	872.3	Natural	1
L443	5_46 ALL	5_46 MID	150.8	0.013	830.8	830.5	Circular	0.75
L44TH-1	B5571	B5573	639	0.014	809.91	808.09	Circular	10
L44TH-2	B5571	B5573	639	0.015	833.23	826.18	Natural	0.5
L450	5_43 ALL	5_43 ALL2	98	0.013	833.55	833.05	Circular	0.75
L451	5_43 ALL2	43_5A	143	0.013	833.05	832.05	Circular	0.75
L45-1	26-Nic-2	26-1st	308.1	0.014	864.33	863.55	Circular	2.5
L45-2	26-Nic-2	26-1st	308.1	0.015	872.3	871.3	Natural	1
L45TH-1	B5569	B5571	710	0.014	811.97	809.94	Circular	10
L45TH-2	B5569	B5571	710	0.015	831.05	833.23	Natural	0.5
L46-1	26-Stev	27-Stev	661.2	0.014	862.42	859.69	Circular	3
L46-2	26-Stev	27-Stev	661.2	0.015	870.3	866.43	Natural	1
L474	44_3 ALL1	44_3 MID	129.8	0.013	835.3	834.55	Circular	0.75
L477	44_CL ALL	44CL_MID	289.9	0.013	832.3	831.3	Circular	1
L48	N50	26-Stev	339	0.014	875.07	864.5	Circular	1
L49-1	27-Pils	27-Bla	385	0.014	864.46	863.76	Circular	2
L49-2	27-Pils	27-Bla	385	0.015	872.3	870.15	Natural	1
L497	45_3 ALL	45_3 MID	274.8	0.013	832.8	831.8	Circular	0.75
L49TH_DI	49TH_DI	49TH_ORIF	59	0.014	831.03	830.55	Circular	4
L50-1	27-Bla	27-Bla-2	61.6	0.014	863.45	863.33	Circular	3
L50-2	27-Bla	27-Bla-2	61.6	0.015	870.15	870.1	Natural	1
L506	46_2 ALL1	46_2 MID	367.5	0.013	833.835	832.83	Circular	0.75
L507	46_MID B	46_MID A	35	0.013	832.05	831.87	Circular	0.75
L508	46_2 ALL	46_MID B	294.3	0.013	833.55	832.05	Circular	0.75
L5-1	24-3rd	N23	101.3	0.014	879.89	876.34	Circular	2
L51-1	27-Bla-2	27-Nic	372.9	0.014	863.33	861.88	Circular	3
L51-2	27-Bla-2	27-Nic	372.9	0.015	870.1	868.94	Natural	1
L5-2	24-3rd	N23	101.3	0.015	887.35	887.25	Natural	1
L520	46_4 ALL	46_MID	177.4	0.013	829.05	828.3	Circular	1
L52-1	27-Nic	27-Nic-2	88	0.014	861.15	860.58	Circular	3.5
L52-2	27-Nic	27-Nic-2	88	0.015	869	868.94	Natural	1
L53-1	27-Nic-2	27-1st	279.8	0.014	860.48	859.15	Circular	3.5
L53-2	27-Nic-2	27-1st	279.8	0.015	868.94	867.3	Natural	1
L538	48_5 ALL	48_5 MID	76.5	0.013	826.55	825.8	Circular	0.75
L54-1	27-1st	27-Stev	292	0.014	859.15	857.23	Circular	3.5
L54-2	27-1st	27-Stev	292	0.015	867.4	866.43	Natural	1
L545	49_2 ALL	49_2 MID	166	0.013	841.05	839.3	Circular	0.75

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
L546	R255	43_5	674	0.016	840.23	837.8	Natural	0.5
L55-1	27-Stev	27-Stev-2	56.9	0.014	853.69	853.88	Circular	3.5
L55-2	27-Stev	27-Stev-2	56.9	0.015	866.43	866.3	Natural	1
L557	49_RU ALL	U27025	218.5	0.016	900.05	898.8	Natural	0.5
L56-1	27-Stev-2	27-2nd	292	0.014	853.88	851.2	Circular	4.5
L56-2	27-Stev-2	27-2nd	292	0.015	866.2	865.3	Natural	1
L563	U24206-2	U24220	458	0.013	860.3	857.8	Circular	0.75
L564	U24206-2	44_WE ALL3	150	0.016	864.5	859	Natural	0.5
L565	44_WE ALL3	U24211	400	0.016	859	858.3	Natural	0.5
L566	T23794	N509	474	0.013	875.4	873.5	Circular	1
L569	N509	T23544	25	0.013	875	874.9	Circular	0.833
L57-1	27-2nd	27-2nd-2	40	0.014	851.2	851.49	Circular	4.5
L57-2	27-2nd	27-2nd-2	40	0.015	865.4	865.3	Natural	1
L576	T22233	42_HA	155	0.016	882.5	881.72	Natural	0.5
L577	42_HA	T22824	174	0.016	881.11	880.1	Natural	1
L578	T22962	U23539	380	0.016	875	870.8	Natural	0.5
L579	R14	R48	300	0.016	845.8	839.5	Circular	1
L58-1	27-2nd-2	27-3rd	289.7	0.014	851.49	848.56	Circular	4.5
L58-2	27-2nd-2	27-3rd	289.7	0.015	865.3	864.3	Natural	1
L587	U26732	RU	404	0.016	895.8	890.5	Natural	0.5
L589	49_5 ALL	49_5 MID	268	0.013	825.83	824.7	Circular	0.75
L59-1	27-3rd	27-Clint	113	0.014	848.56	847.84	Circular	4.5
L59-2	27-3rd	27-Clint	113	0.015	864.3	864.15	Natural	1
L594	46_3B	46_3	365	0.016	836.5	836.3	Natural	0.5
L595	46_2 ALL1	46_3B	155	0.1	836.5	836.5	Natural	0.5
L596	46_2 ALL	46_3C	166	0.1	836.5	836.5	Natural	0.5
L597	46_3C	46_3	308	0.016	836.5	836.3	Natural	0.5
L598	45_PO	OAK OUT5	389.25	0.016	835.3	831.5	Natural	0.5
L600	47_PO	OAK OUT3	384	0.016	834.41	833.5	Natural	0.5
L60-1	27-Clint	27-Clint-2	36.6	0.014	847.45	847.22	Circular	4.5
L60-2	27-Clint	27-Clint-2	36.6	0.015	864.15	864.3	Natural	1
L606	44_3 ALL1	44_3	250	0.1	839.8	838	Natural	0.5
L607	45_3 ALL	45_CL	400	0.1	835.8	836.3	Natural	0.5
L6-1	24-Clin	24-4th	303.7	0.014	861.35	859.06	Circular	2.25
L610	49_RU ALL2	RU	316	0.1	895.5	890.5	Natural	0.5
L611	49_RU ALL	49_PL MID	146	0.016	900.05	898.37	Natural	0.5
L61-1	27-Clint-2	27-35W	220	0.014	833.79	831.23	Circular	4
L61-2	27-Clint-2	27-35W	220	0.015	864.3	851.35	Natural	1
L6-2	24-Clin	24-4th	303.7	0.015	869.3	867.3	Natural	1
L62-1	27-35W	DS4(27TH)	187	0.014	829.49	827.38	Circular	6.5
L62-2	27-35W	DS4(27TH)	187	0.014	851.35	859	Natural	1
L63	27-4th	DS4(27TH)	150	0.014	847.18	846.3	Circular	3
L65	N67	DS4(27TH)	608.9	0.014	837.69	836.55	Circular	4
L66-1	N69	27-4th	175.6	0.014	847.57	847.36	Circular	3

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
L66-2	N69	27-4th	175.6	0.015	857.8	859.3	Natural	1
L67-1	27-5th	N69	144.5	0.014	847.76	847.57	Circular	3
L67-2	27-5th	N69	144.5	0.015	857.3	857.8	Natural	1
L68-1	27-5th-2	27-5th	73	0.014	848.06	847.76	Circular	3
L68-2	27-5th-2	27-5th	73	0.015	857.8	857.3	Natural	1
L69-1	27-Port	27-5th-2	248.7	0.014	853.61	851.86	Circular	2
L69-2	27-Port	27-5th-2	248.7	0.015	861.3	857.8	Natural	1
L7009A	7009A	J7010	117.6	0.014	815.8	812.93	Circular	4
L70-1	27-Port-2	27-Port	71.4	0.014	854.19	853.61	Circular	2
L70-2	27-Port-2	27-Port	71.4	0.015	861.3	861.3	Natural	1
L71-1	27-Oak	27-Port-2	275.8	0.014	855.82	854.19	Circular	2
L71-2	27-Oak	27-Port-2	275.8	0.015	864.3	861.3	Natural	1
L72-1	27-Park	27-Oak	284.3	0.014	858.01	855.82	Circular	2
L72-2	27-Park	27-Oak	284.3	0.015	863.3	864.3	Natural	1
L73-1	27-Park-2	27-Park	86.5	0.014	858.62	858.14	Circular	1.75
L73-2	27-Park-2	27-Park	86.5	0.015	863.4	863.3	Natural	1
L74-1	27-Colum	27-Park-2	276.3	0.014	859.97	858.62	Circular	1
L74-2	27-Colum	27-Park-2	276.3	0.015	864.3	863.3	Natural	1
L75-1	28-Clin	N67	160	0.014	848.28	844.09	Circular	2
L75-2	28-Clin	N67	160	0.015	861.41	853	Natural	1
L76-1	2Av-Clin	28-Clin	116.6	0.014	850.09	849.62	Circular	2
L76-2	2Av-Clin	28-Clin	116.6	0.015	858.82	861.41	Natural	1
L78	2Av-Clin-3	2Av-Clin	37.9	0.014	853.16	852.67	Circular	1.5
L79	2-3AV	2Av-Clin-3	242	0.014	856.05	853.47	Circular	1.5
L80	2-3Av-2	2-3AV	83.5	0.014	857.16	856.25	Circular	1.5
L81-1	28-4th	N67	135.6	0.014	838.09	837.69	Circular	4
L81-2	28-4th	N67	135.6	0.015	849.05	853	Natural	1
L82-1	28-5th	28-4th	241.2	0.014	838.8	838.09	Circular	4
L82-2	28-5th	28-4th	241.2	0.015	849.3	849.05	Natural	1
L83-1	28-5th-2	28-5th	36.2	0.014	843.26	842.66	Circular	2.25
L83-2	28-5th-2	28-5th	36.2	0.015	848.3	849.3	Natural	1
L84-1	29-5th	28-5th	670	0.014	840.12	838.8	Circular	2.5
L84-2	29-5th	28-5th	670	0.015	847.8	849.3	Natural	1
L85-1	TorAdd	28-5th-2	124.7	0.014	844.65	843.26	Circular	2
L85-2	TorAdd	28-5th-2	124.7	0.015	853.3	848.3	Natural	1
L86-1	28-Port	TorAdd	136	0.014	847.34	844.73	Circular	2
L86-2	28-Port	TorAdd	136	0.015	859	853.3	Natural	1
L87-1	28-Port-2	28-Port	75.8	0.014	847.74	847.74	Circular	2
L87-2	28-Port-2	28-Port	75.8	0.015	859.6	859	Natural	1
L88-1	28-Oak	28-Port-2	324.3	0.014	854.2	851.1	Circular	2
L88-2	28-Oak	28-Port-2	324.3	0.015	863.5	859.6	Natural	1
L89-1	28-Park	28-Oak	294.2	0.014	856.7	854.8	Circular	1.75
L89-2	28-Park	28-Oak	294.2	0.015	865.2	863.5	Natural	1
L90-1	28-Park-2	28-Park	43.9	0.014	857	856.7	Circular	1.75

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
L90-2	28-Park-2	28-Park	43.9	0.015	865.3	865.2	Natural	1
L9-1	24-Port	24-Port-2	63	0.014	860.49	859.93	Circular	1.25
L91-1	28-Colum	28-Park-2	306.5	0.014	858.5	857	Circular	1.5
L91-2	28-Colum	28-Park-2	306.5	0.015	866	865.3	Natural	1
L9-2	24-Port	24-Port-2	63	0.015	865.56	865.43	Natural	1
L92-1	28-Stev	27-Stev	650	0.014	861.11	858.8	Circular	2.75
L92-2	28-Stev	27-Stev	634.5	0.015	868.3	866.43	Natural	1
L93-1	28-Stev-2	28-Stev	43.2	0.014	861.3	861.17	Circular	2.75
L93-2	28-Stev-2	28-Stev	43.2	0.015	868.4	868.3	Natural	1
L94-1	28-1st	28-Stev-2	290.6	0.014	862.44	861.55	Circular	2.5
L94-2	28-1st	28-Stev-2	290.6	0.015	869.8	868.3	Natural	1
L95-1	28-1st-2	28-1st	35.7	0.014	863.05	862.94	Circular	2.5
L95-2	28-1st-2	28-1st	35.7	0.015	869.9	869.8	Natural	1
L96-1	28-Nic	28-1st-2	290.5	0.014	864.08	863.05	Circular	2
L96-2	28-Nic	28-1st-2	290.5	0.015	871.3	869.8	Natural	1
L97-1	28-Nic-2	28-Nic	51.8	0.014	864.2	864.08	Circular	2
L97-2	28-Nic-2	28-Nic	51.8	0.015	871.4	871.3	Natural	1
L99-1	29-Nic	28-Nic	396.5	0.014	866.3	864.62	Circular	1.75
L99-2	29-Nic	28-Nic	396.5	0.015	872	871.3	Natural	1
LB5565-1	B5565	B5569	288	0.014	812.81	812	Circular	10
LB5565-2	B5565	B5569	288	0.015	829.25	831.05	Natural	0.5
LC5429	C5429	C5430	97	0.014	820.41	819.54	Circular	2.25
LC5430	C5430	B5573	92	0.014	815.39	815.02	Circular	2.5
LD6172-1	D6172	D6572	342	0.014	845.1	842.87	Circular	1.5
LD6172-2	D6172	D6572	342	0.015	847.98	849.3	Natural	1
LD6504-1	D6504	D6572	147.5	0.014	843.62	842.87	Circular	1
LD6504-2	D6504	D6572	147.5	0.015	848.8	849.3	Natural	1
LD6572-1	D6572	D6708	366	0.014	842.87	841.14	Circular	2.5
LD6572-2	D6572	D6708	366	0.015	849.3	848.05	Natural	1
LD6591-1	D6591	D6720	193	0.014	839.86	839.44	Circular	1.5
LD6591-2	D6591	D6720	193	0.015	845.55	846.74	Natural	1
LD6616-1	D6616	D6591	66.1	0.014	840.47	839.8	Circular	1
LD6616-2	D6616	D6591	66.1	0.015	844.47	845.55	Natural	1
LD6667-1	D6667	D6572	152	0.014	844.7	842.87	Circular	1.75
LD6667-2	D6667	D6572	152	0.015	851.3	849.3	Natural	1
LD6706-1	D6706	D6761	54.5	0.014	831.01	830.78	Circular	4
LD6706-2	D6706	D6761	54.5	0.015	839.55	839.96	Natural	1.5
LD6708-1	D6708	D6774	219	0.014	841.14	840.62	Circular	2.5
LD6708-2	D6708	D6774	219	0.015	848.05	847.3	Natural	1
LD6720-1	D6720	D6776	49.1	0.014	839.44	839.25	Circular	1.75
LD6720-2	D6720	D6776	49.1	0.015	846.74	846.8	Natural	1
LD6751-1	D6780	D6667	118	0.014	846.1	844.7	Circular	1.75
LD6751-2	D6780	D6667	118	0.015	853.19	851.3	Natural	1
LD6761-1	D6761	D6846	50.7	0.014	830.78	830.62	Circular	4

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LD6761-2	D6761	D6846	50.7	0.015	839.96	839.8	Natural	1
LD6774-1	D6774	D6776	81.5	0.014	840.16	839.26	Circular	2.75
LD6774-2	D6774	D6776	81.5	0.015	847.3	846.8	Natural	1
LD6776-1	D6776	D6818	35.4	0.014	839.14	838.95	Circular	3.5
LD6776-2	D6776	D6818	35.4	0.015	846.8	846.55	Natural	1
LD6813-1	D6813	D6846	68	0.014	832.74	832.56	Circular	4
LD6813-2	D6813	D6846	68	0.015	839.8	839.8	Natural	1
LD6818-1	D6818	D6813	552	0.014	838.95	832.74	Circular	3.5
LD6818-2	D6818	D6813	552	0.015	846.55	839.8	Natural	1
LD6844-1	D6844	D6818	24.7	0.014	839.1	838.95	Circular	3.5
LD6844-2	D6844	D6818	24.7	0.015	846.8	846.55	Natural	1
LD6847-1	D6847	D6953	49.7	0.014	826.55	826.37	Circular	6
LD6847-2	D6847	D6953	49.7	0.015	840.3	840.3	Natural	1
LD6852-1	D6852	D6853	53.4	0.014	827.68	826.68	Circular	6
LD6852-2	D6852	D6853	53.4	0.015	839.3	839.3	Natural	1
LD6853-1	D6853	D6847	274.9	0.014	826.68	826.55	Circular	6
LD6853-2	D6853	D6847	274.9	0.015	839.3	840.3	Natural	1
LD6857-1	D6846	D6865	396	0.014	830.62	829.2	Circular	5.5
LD6857-2	D6846	D6865	396	0.015	839.8	841.3	Natural	1
LD6865-1	D6865	D6894	224.4	0.014	829.2	828.19	Circular	6
LD6865-2	D6865	D6894	224.4	0.015	841.3	839.8	Natural	1
LD6894-1	D6894	D6852	142.6	0.014	828.19	827.68	Circular	6
LD6894-2	D6894	D6852	142.6	0.015	839.8	839.3	Natural	1
LD6948-1	D6948	D6852	41.7	0.014	830.39	830.25	Circular	2
LD6948-2	D6948	D6852	41.7	0.015	839.79	839.3	Natural	1
LD6953-1	D6953	D7121	250.8	0.014	826.37	825.02	Circular	6
LD6953-2	D6953	D7121	250.8	0.015	840.3	841.3	Natural	1
LD7121-1	D7121	D7176	173.5	0.014	823.42	823.12	Circular	6
LD7121-2	D7121	D7176	173.5	0.015	841.3	841.8	Natural	1
LD7150-1	D7150	D6865	295	0.014	833.52	831	Circular	3.5
LD7150-2	D7150	D6865	295	0.015	842.49	841.3	Natural	1
LD7163-1	D7163	D6948	283	0.014	835.79	833.44	Circular	1.5
LD7163-2	D7163	D6948	283	0.015	843.3	839.79	Natural	1
LD7165-1	D7165	D7185	68.4	0.014	836.4	836.11	Circular	1.25
LD7165-2	D7165	D7185	68.4	0.015	844.3	844.16	Natural	1
LD7170-1	D7170	D7121	33.4	0.014	823.59	823.42	Circular	6
LD7170-2	D7170	D7121	33.4	0.015	841.55	841.3	Natural	1
LD7176-1	D7176	D7436	399.9	0.014	823.12	822.4	Circular	6
LD7176-2	D7176	D7436	399.9	0.015	841.8	840.8	Natural	1
LD7181-1	D7181	D7150	29.6	0.014	835.12	835.02	Circular	2.75
LD7181-2	D7181	D7150	29.6	0.015	842.6	842.49	Natural	1
LD7185-1	D7185	D7181	313.2	0.014	835.86	835.12	Circular	2.75
LD7185-2	D7185	D7181	313.2	0.015	844.16	842.6	Natural	1
LD7185-3	D7185	D6846	323.9	0.015	844.16	839.8	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LD7264-1	D7264	D7185	54.1	0.014	837.37	837.4	Circular	2.5
LD7264-2	D7264	D7185	54.1	0.015	844.7	844.16	Natural	1
LD7436-1	D7436	D7476	79.1	0.014	822.4	822.26	Circular	6
LD7436-2	D7436	D7476	79.1	0.015	840.8	840.8	Natural	1
LD7476-1	D7476	D7521	46.4	0.014	822.26	822.17	Circular	6
LD7476-2	D7476	D7521	46.4	0.015	840.8	840.8	Natural	1
LD7521-1	D7521	D7588	50	0.014	822.17	822.08	Circular	6
LD7521-2	D7521	D7588	50	0.015	840.8	840.8	Natural	1
LD7539-1	D7539	D7150	309	0.014	836.57	835	Circular	1.5
LD7539-2	D7539	D7150	309	0.015	843.56	842.49	Natural	1
LD7552-1	D7552	D7264	256.1	0.014	840.19	837.76	Circular	2
LD7552-2	D7552	D7264	256.1	0.015	846.3	844.7	Natural	1
LD7588-1	D7588	DS6	264.22	0.014	822.08	821.6	Circular	6
LD7588-2	D7588	DS6	264.22	0.015	840.8	840.9	Natural	1
LD7746-1	D7746	D7539	274.4	0.014	837.85	836.57	Circular	1.5
LD7746-2	D7746	D7539	274.4	0.015	844.62	843.56	Natural	1
LD7886-1	D7886	D7552	319.2	0.014	842	840.22	Circular	1.5
LD7886-2	D7886	D7552	319.2	0.015	848.3	846.3	Natural	1
LDS1-1	DS1(39th)	DS2(35th)	2724	0.014	749.54	745.74	Circular	12
LDS12	DS12	DS13	300	0.014	742.3	741.99	Circular	9
LDS13	DS13	DS14	1375	0.014	741.99	740.63	Circular	9
LDS14	DS14	DS15	675	0.014	737.625	736.94	Circular	12
LDS15	DS15	DS16	300	0.014	736.94	736.66	Circular	12
LDS16-1	DS16	JUNCT	150	0.014	736.66	736.49	Circular	12
LDS16-2	DS16	JUNCT	150	0.015	810.86	855.5	Natural	1
LDS3(31ST)	DS3(31ST)	DS4(27TH)	2765	0.014	743.1	739.4	Circular	12
LDS4(27TH)	DS4(27TH)	JUNCT	4455	0.014	739.4	736.43	Circular	12
LDS6	DS6	DS7	1775	0.014	731.5	729.7	Circular	14
LDS7	DS7	DS8	600	0.014	729.7	729.3	Circular	14
LDS8	DS8	DS9	2000	0.014	729.3	727.5	Circular	14
LDS9	DS9	RIVER	825	0.014	727.5	726.8	Circular	14
LG7878-1	G7878	G7922	33.1	0.014	843.6	843.1	Special	2.609
LG7878-2	G7878	G7922	33.1	0.015	856.3	856.3	Natural	1
LG7893-1	G7893	G7878	295.7	0.014	845.94	845	Circular	3.5
LG7893-2	G7893	G7878	295.7	0.015	857.3	856.3	Natural	1
LG7903-1	G7903	G7893	300.01	0.014	847.08	845.94	Circular	3.5
LG7903-2	G7903	G7893	300.01	0.015	856.3	857.3	Natural	1
LG7922-1	G7922	G8248	371.5	0.014	843.1	841.34	Circular	4
LG7922-2	G7922	G8248	371.5	0.015	856.3	857.8	Natural	1
LG7944-1	G7944	G7922	303.5	0.014	848.56	848.27	Circular	1.25
LG7944-2	G7944	G7922	303.5	0.015	855.8	856.3	Natural	1
LG7955-1	G7955	G7903	79	0.014	847.2	847.08	Circular	3.5
LG7955-2	G7955	G7903	79	0.015	856.3	856.3	Natural	1
LG7985-1	G7985	G7955	287	0.014	848.31	847.2	Circular	3

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LG7985-2	G7985	G7955	287	0.015	855.3	856.3	Natural	1
LG7985-4	G7985	DS13	381.18	0.015	855.3	853.2	Natural	1
LG8163-1	G8163	DS14	19.42	0.014	849	848.9	Circular	3
LG8163-2	G8163	DS14	19.42	0.015	855.3	856.5	Natural	1
LG8219-1	G8374	G7985	271.6	0.014	854.37	850.06	Circular	2.75
LG8219-2	G8374	G7985	271.6	0.015	860.8	855.3	Natural	1
LG8248-1	G8248	G8252	259.1	0.014	841.32	839.8	Circular	4.5
LG8248-2	G8248	G8252	259.1	0.015	857.8	857.3	Natural	1
LG8250-1	G8250	DS14	120.77	0.014	836.6	836	Circular	4.5
LG8250-2	G8250	DS14	120.77	0.015	857.8	856.5	Natural	1
LG8251-1	G8251	G8255	110	0.014	837.4	837.5	Circular	4.5
LG8251-2	G8251	G8255	110	0.015	857.3	857.55	Natural	1
LG8252-1	G8252	G8251	17.7	0.014	839.8	837.4	Circular	4.5
LG8252-2	G8252	G8251	17.7	0.015	857.3	857.3	Natural	1
LG8253-1	G8253	G8250	3.5	0.014	837.1	836.6	Circular	4.5
LG8253-2	G8253	G8250	3.5	0.015	857.8	857.8	Natural	1
LG8254-1	G8254	G8163	59	0.014	849.61	849	Circular	2.25
LG8254-2	G8254	G8163	59	0.015	857.3	855.3	Natural	1
LG8255-1	G8255	G8253	80.7	0.014	837.3	836.3	Circular	4.5
LG8255-2	G8255	G8253	80.7	0.015	857.55	857.8	Natural	1
LG8261-1	G8261	G8254	283.3	0.014	850.54	849.61	Circular	1.25
LG8261-2	G8261	G8254	283.3	0.015	856.3	857.3	Natural	1
LG8261-4	G8261	DS15	349.37	0.015	856.3	845	Natural	0.5
LG8273-1	G8273	G8280	288.9	0.014	853.19	851.24	Circular	1.75
LG8273-2	G8273	G8280	288.9	0.015	860.8	858.3	Natural	1
LG8275-1	G8275	G8248	44.1	0.014	846.42	845.25	Circular	2.5
LG8275-2	G8275	G8248	44.1	0.015	857.8	857.8	Natural	1
LG8276-1	G8276	G8275	294	0.014	850.03	849.22	Circular	2.5
LG8276-2	G8276	G8275	294	0.015	858.3	857.8	Natural	1
LG8280-1	G8280	G8276	33.6	0.014	851.04	850.93	Circular	1.75
LG8280-2	G8280	G8276	33.6	0.015	858.4	858.3	Natural	1
LG8326-1	G8326	G8254	25.9	0.014	850.11	849.95	Circular	2.25
LG8326-2	G8326	G8254	25.9	0.015	857.3	857.3	Natural	1
LG8337-1	G8337	G8255	84.1	0.014	850.63	848.55	Circular	2
LG8337-2	G8337	G8255	84.1	0.015	857.3	857.55	Natural	1
LG8380-1	G8380	G8273	36.1	0.014	854.19	854.19	Circular	1.75
LG8380-2	G8380	G8273	36.1	0.015	861.3	860.8	Natural	1
LG8430-1	G8430	G8380	107.7	0.014	855.95	854.25	Circular	1.75
LG8430-2	G8430	G8380	107.7	0.015	863.3	861.3	Natural	1
LG8484-1	G8484	G8374	187.9	0.014	855.8	854.37	Circular	2.75
LG8484-2	G8484	G8374	187.9	0.015	863.3	860.8	Natural	1
LG8502-1	G8502	G8588	271.4	0.014	0	0	Circular	0
LG8502-2	G8502	G8588	271.4	0.015	0	0	Natural	1
LG8580-1	G8580	G8484	103.1	0.014	856.72	855.8	Circular	2.75

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LG8580-2	G8580	G8484	103.1	0.015	864.3	863.3	Natural	1
LG8588-1	G8588	G8615	30.9	0.014	0	0	Circular	0
LG8588-2	G8588	G8615	30.9	0.015	0	0	Natural	1
LG8590-1	G8590	G8608	50.6	0.014	864.6	864.25	Circular	2
LG8590-2	G8590	G8608	50.6	0.015	873.3	872.3	Natural	1
LG8592-1	G8592	G8594	26.4	0.014	865.95	865.3	Circular	2
LG8592-2	G8592	G8594	26.4	0.015	873.4	873.3	Natural	1
LG8594-1	G8594	G8590	21.1	0.014	865.3	864.6	Circular	2
LG8594-2	G8594	G8590	21.1	0.015	873.4	873.3	Natural	1
LG8599-1	G8618	G8600	301	0.014	890.65	871.83	Circular	1.5
LG8599-2	G8618	G8600	301	0.015	897.3	878.3	Natural	1
LG8600-1	G8600	G8592	39.9	0.014	866.81	865.95	Circular	2
LG8600-2	G8600	G8592	39.9	0.015	878.3	873.3	Natural	1
LG8608-1	G8608	G8610	242.6	0.014	864.25	860.09	Circular	2
LG8608-2	G8608	G8610	242.6	0.015	872.3	866.3	Natural	1
LG8610-1	G8610	G8612	48.3	0.014	860.09	859.59	Circular	2
LG8610-2	G8610	G8612	48.3	0.015	866.3	864.8	Natural	1
LG8611-1	G8611	G8580	42.8	0.014	856.52	856.72	Circular	2.75
LG8611-2	G8611	G8580	42.8	0.015	864.8	864.3	Natural	1
LG8612-1	G8612	G8611	61.7	0.014	859.59	859.5	Circular	2
LG8612-2	G8612	G8611	61.7	0.015	864.9	864.8	Natural	1
LG8615-1	G8615	G8618	20.8	0.014	0	0	Circular	0
LG8615-2	G8615	G8618	20.8	0.015	0	897.3	Natural	1
LG8620-1	G8620	G8594	30.2	0.014	866.91	865.3	Circular	1.5
LG8620-2	G8620	G8594	30.2	0.015	873.4	873.3	Natural	1
LG8632-1	G8632	G8612	28.2	0.014	860.3	859.73	Circular	1
LG8632-2	G8632	G8612	28.2	0.015	865.3	864.8	Natural	1
LG8678-1	G8678	G8326	427.4	0.014	852.79	850.11	Circular	2.25
LG8678-2	G8678	G8326	427.4	0.015	858.8	857.3	Natural	1
LG8685-1	G8685	G8611	80.5	0.014	859.72	859.3	Circular	1.75
LG8685-2	G8685	G8611	80.5	0.015	865.55	864.8	Natural	1
LG8699-1	G8699	G8276	446	0.014	853.08	850.18	Circular	2
LG8699-2	G8699	G8276	446	0.015	860.3	858.3	Natural	1
LG8710-1	G8710	G8678	326	0.014	853.71	852.79	Circular	1.75
LG8710-2	G8710	G8678	326	0.015	860.3	858.8	Natural	1
LG8721-1	G8721	G8430	319.1	0.014	860.28	855.95	Circular	1.75
LG8721-2	G8721	G8430	319.1	0.015	868.8	863.3	Natural	1
LG8721-3	G8721	G8745	328.22	0.015	868.8	860.3	Natural	1
LG8745-1	G8745	G8699	26.3	0.014	853.3	853.08	Circular	2
LG8745-2	G8745	G8699	26.3	0.015	860.4	860.3	Natural	1
LG8765-1	G8765	G8678	36.3	0.014	852.78	852.79	Circular	1.75
LG8765-2	G8765	G8678	36.3	0.015	858.8	858.8	Natural	1
LG8768-1	G8768	G8685	36.5	0.014	860.43	859.72	Circular	1.5
LG8768-2	G8768	G8685	36.5	0.015	866.05	865.55	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LG8778-1	G8778	G8337	471	0.014	852.11	850.63	Circular	2
LG8778-2	G8778	G8337	471	0.015	859.3	857.3	Natural	1
LG8783-1	G8783	G8248	508.5	0.014	856.19	850.94	Circular	1.75
LG8783-2	G8783	G8248	508.5	0.015	862.3	857.8	Natural	1
LG8783-3	G8783	G8745	327.5	0.015	862.3	860.3	Natural	1
LG8805-1	G8805	G8618	132	0.014	897.06	892.72	Circular	1.25
LG8805-2	G8805	G8618	132	0.015	902.3	897.3	Natural	1
LG8817-1	G8817	G8620	166.4	0.014	869.98	866.91	Circular	1.5
LG8817-2	G8817	G8620	166.4	0.015	876.3	873.3	Natural	1
LG8820-1	G8820	G8610	194.4	0.014	0	0	Circular	1
LG8820-2	G8820	G8610	194.4	0.015	0	866.3	Natural	1
LG8837-1	G8837	G8632	236.2	0.014	864.81	860.31	Circular	1
LG8837-2	G8837	G8632	236.2	0.015	870.3	865.3	Natural	1
LG8872-1	G8872	G8817	164.1	0.014	873.02	869.98	Circular	1.5
LG8872-2	G8872	G8817	164.1	0.015	880.8	876.3	Natural	1
LG9023-1	G9023	G8872	173.3	0.014	876.23	873.02	Circular	1.5
LG9023-2	G9023	G8872	173.3	0.015	884.71	880.8	Natural	1
LG9037-1	G9037	G8745	411.1	0.014	864.3	853.3	Circular	1.75
LG9037-2	G9037	G8745	411.1	0.015	872.3	860.3	Natural	1
LG9043-1	G9043	G8710	433.7	0.014	856.03	853.8	Circular	1.5
LG9043-2	G9043	G8710	433.7	0.015	864.48	860.3	Natural	1
LG9049-1	G9049	G8778	401	0.014	855.18	852.11	Circular	1.75
LG9049-2	G9049	G8778	401	0.015	862.05	859.3	Natural	1
LG9051-1	G9051	G8783	399.9	0.014	857.91	856.19	Circular	1.75
LG9051-2	G9051	G8783	399.9	0.015	863.8	862.3	Natural	1
LG9053-1	G9053	G8837	263.6	0.014	869.3	864.81	Circular	1
LG9053-2	G9053	G8837	263.6	0.015	875.3	870.3	Natural	1
LG9057-1	G9057	G9037	8.2	0.014	864.3	864.3	Circular	1.75
LG9057-2	G9057	G9037	8.2	0.015	872.3	872.3	Natural	1
LG9066-1	G9066	G8765	415.7	0.014	857.8	852.78	Circular	1.5
LG9066-2	G9066	G8765	415.7	0.015	864.3	858.8	Natural	1
LG9139-1	G9139	G9142	100	0.014	893.33	892.28	Circular	1
LG9139-2	G9139	G9142	100	0.015	898.18	897.41	Natural	1
LG9142-1	G9142	G9143	105.8	0.014	891.24	889.54	Circular	1.25
LG9142-2	G9142	G9143	105.8	0.015	897.41	895.48	Natural	1
LG9143-1	G9143	G9147	309.6	0.014	888.43	884.22	Circular	1.25
LG9143-2	G9143	G9147	309.6	0.015	895.48	889.85	Natural	1
LG9144-1	G9144	G9023	52.6	0.014	877.79	877.24	Circular	1.5
LG9144-2	G9144	G9023	52.6	0.015	885.68	884.71	Natural	1
LG9146-1	G9146	G9144	369.7	0.014	883.07	877.84	Circular	1.5
LG9146-2	G9146	G9144	369.7	0.015	889.1	885.68	Natural	1
LG9147-1	G9147	G9146	77.4	0.014	884.22	883.07	Circular	1.5
LG9147-2	G9147	G9146	77.4	0.015	889.85	889.1	Natural	1
LG9155-1	G9155	G8721	456.5	0.014	871.49	862.13	Circular	1.75

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LG9155-2	G9155	G8721	456.5	0.015	881.3	868.8	Natural	1
LG9155-3	G9155	G9270	329.19	0.015	881.3	872	Natural	1
LG9165-1	G9165	G9155	241.7	0.014	872.65	871.49	Circular	1.25
LG9165-2	G9165	G9155	241.7	0.015	878.3	881.3	Natural	1
LG9165-3	G9165	G9053	111.83	0.015	878.3	875.3	Natural	1
LG9226-1	G9226	G9051	43.8	0.014	858.08	857.91	Circular	1.75
LG9226-2	G9226	G9051	43.8	0.015	864.05	863.8	Natural	1
LG9233-1	G9233	G9053	49.9	0.014	870.59	869.59	Circular	1
LG9233-2	G9233	G9053	49.9	0.015	876.8	875.3	Natural	1
LG9270-1	G9270	G9057	51.8	0.014	864.44	864.3	Circular	1.75
LG9270-2	G9270	G9057	51.8	0.015	872	872.3	Natural	1
LG9270-3	G9270	G9226	329.15	0.015	872	864.05	Natural	1
LG9274-1	G9274	G9049	56.2	0.014	855.57	855.18	Circular	1.75
LG9274-2	G9274	G9049	56.2	0.015	862.55	862.05	Natural	1
LG9284-1	G9284	G9043	65.7	0.014	856.5	856.08	Circular	1.5
LG9284-2	G9284	G9043	65.7	0.015	864.54	864.48	Natural	1
LG9288-1	G9288	G9023	76.4	0.014	877.55	876.36	Circular	1.5
LG9288-2	G9288	G9023	76.4	0.015	884.55	884.71	Natural	1
LG9288-3	G9288	G9233	368.44	0.015	884.55	876.8	Natural	1
LG9289-1	G9289	G9066	59.6	0.014	859.28	857.8	Circular	1.5
LG9289-2	G9289	G9066	59.6	0.015	864.3	864.3	Natural	1
LI7111-1	I7111	I7290	99	0.014	841.8	841.15	Circular	2
LI7111-2	I7111	I7290	99	0.015	0	0	Natural	1
LI7166-1	I7166	I7538	293	0.014	844.8	844.3	Circular	2.75
LI7166-2	I7166	I7538	293	0.015	844.8	841.99	Natural	1
LI7177-1	I7177	I7403	148	0.014	849	848.3	Circular	2
LI7177-2	I7177	I7403	148	0.015	854.3	855	Natural	1
LI7258-1	I7258	I7290	37.6	0.014	842.03	841.18	Circular	2
LI7258-2	I7258	I7290	37.6	0.015	0	0	Natural	1
LI7290-1	I7290	I7312	32.6	0.014	841.18	840.43	Circular	2
LI7290-2	I7290	I7312	32.6	0.015	0	852.8	Natural	1
LI7312-1	I7312	I7314	299.5	0.014	838.93	838.65	Circular	4
LI7312-2	I7312	I7314	299.5	0.015	852.8	849	Natural	1
LI7314-1	I7314	I7336	23.3	0.014	838.65	837.73	Circular	4
LI7314-2	I7314	I7336	23.3	0.015	849	847.3	Natural	1
LI7336-1	I7336	I7400	64.7	0.014	837.73	837.1	Circular	4
LI7336-2	I7336	I7400	64.7	0.015	847.3	851.1	Natural	1
LI7400-1	I7400	I7541	142.5	0.014	837.1	836.7	Circular	4
LI7400-2	I7400	I7541	142.5	0.015	851.1	850.5	Natural	1
LI7403-1	I7403	I7503	177.2	0.014	848.3	847.38	Circular	2
LI7403-2	I7403	I7503	177.2	0.015	855	855.1	Natural	1
LI7420-1	I7420	I7312	98	0.014	842.93	842.43	Circular	2
LI7420-2	I7420	I7312	98	0.015	854.3	852.8	Natural	1
LI7428-1	I7428	I7312	151.4	0.014	839.38	838.93	Circular	3.5

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LI7428-2	I7428	I7312	151.4	0.015	854.3	852.8	Natural	1
LI7503-1	I7503	I7517	131	0.014	847.2	846.26	Circular	2
LI7503-2	I7503	I7517	131	0.015	855.1	854.2	Natural	1
LI7517-1	I7517	I7528	36.4	0.014	846.26	846.42	Circular	2
LI7517-2	I7517	I7528	36.4	0.015	854.2	854.7	Natural	1
LI7528-1	I7528	I7538	36.7	0.014	842.16	841.99	Special	2
LI7528-2	I7528	I7538	36.7	0.015	854.7	855.3	Natural	1
LI7530-1	I7530	I7532	304.3	0.014	841.17	840.43	Circular	3.5
LI7530-2	I7530	I7532	304.3	0.015	855.2	856.4	Natural	1
LI7532-1	I7532	I7533	181.1	0.014	840.43	840.18	Circular	3.5
LI7532-2	I7532	I7533	181.1	0.015	856.4	855.8	Natural	1
LI7533-1	I7533	I7428	131.1	0.014	840.18	839.38	Circular	3.5
LI7533-2	I7533	I7428	131.1	0.015	855.8	854.3	Natural	1
LI7538-1	I7538	I7530	275.9	0.014	841.99	841.17	Circular	3.5
LI7538-2	I7538	I7530	275.9	0.015	855.3	855.2	Natural	1
LI7541-1	I7541	I7615	103.3	0.014	833.98	833.55	Circular	4
LI7541-2	I7541	I7615	103.3	0.015	850.5	851	Natural	1
LI7549-1	I7549	I7420	123.8	0.014	843.68	842.93	Circular	2
LI7549-2	I7549	I7420	123.8	0.015	852.3	854.3	Natural	1
LI7553-1	I7553	I7549	280	0.014	845.07	844.09	Circular	1.25
LI7553-2	I7553	I7549	280	0.015	845.07	843.68	Natural	1
LI7615-1	I7615	DS12	22.85	0.014	745.7	745.3	Circular	9
LI7615-2	I7615	DS12	22.85	0.015	851	856.9	Natural	1
Link411	46_GA ALL	U25994	500	0.014	866.17	864.67	Circular	1
Link418	Node386	Node387	152	0.014	832.23	831.47	Circular	1.25
Link419	Node387	B5571	189	0.014	820.95	820	Circular	1.25
Link433	46TH-15	B5551	40	0.014	853.8	849.71	Circular	1.75
Link434	B5551	B5552	398	0.014	849.38	847.33	Circular	1.75
Link435	B5552	B5553	400	0.014	846.2	844.14	Circular	1.75
Link436	B5553	B5554	400	0.014	844.02	841.95	Circular	1.75
Link437	B5554	B5555	305	0.014	841.83	840.26	Circular	1.75
Link438	B5555	B5557	31	0.014	832.9	832.78	Circular	1.75
Link439	B5557	B5558	665	0.014	828.98	826.22	Circular	5.5
Link440	B5558	B5561	653	0.014	826.2	823.48	Circular	5.5
Link441	B5561	B5564	718	0.014	821.29	817.03	Circular	7.5
Link442	B5564	B5565	282	0.014	817	815.35	Circular	7.5
Link527	DS1(39th)	35TH_D	1304	0.015	837.1	843.3	Natural	0.5
Link537	Node539	SouthPondB	33	0.014	855.5	855	Circular	3.5
Link539	Node540	235-0	713	0.014	852.5	843.5	Circular	3
link540.1	24/25-35WA	North Pond	400	0.014	846.58	843	Circular	3
link540r	24/25-35WA	North Pond	400	0.014	855.94	849	Natural	1
LJ10015-11	J10015	J10018	43.6	0.014	853.24	852.97	Circular	1.5
LJ10015-12	J10015	J9941	11.7	0.014	852.84	852.8	Circular	1.5
LJ10015-21	J10015	J10018	43.6	0.015	858.55	858.8	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ10015-22	J10015	J9941	11.7	0.015	858.55	858.8	Natural	1
LJ10016-2	J10016	J9986	160.1	0.015	858.8	858.3	Natural	1
LJ10016-3	J10016	J9986	160.1	0.014	852.26	851.3	Circular	1.5
LJ10017-1	J10017	J10015	8.8	0.014	853.3	853.24	Circular	1.5
LJ10017-2	J10017	J10015	8.8	0.015	859.3	858.55	Natural	1
LJ10018-1	J10018	J10016	112.2	0.014	852.97	852.26	Circular	1.5
LJ10018-2	J10018	J10016	112.2	0.015	858.8	858.8	Natural	1
LJ10019-1	J10019	J10017	162.7	0.014	853.79	853.3	Circular	1.25
LJ10019-2	J10019	J10017	162.7	0.015	859.3	859.3	Natural	1
LJ10021-1	J10021	J10022	44.4	0.014	854.3	854.16	Circular	1.25
LJ10021-2	J10021	J10022	44.4	0.015	860.3	860.3	Natural	1
LJ10022-1	J10022	J10019	122	0.014	854.16	853.79	Circular	1.25
LJ10022-2	J10022	J10019	122	0.015	860.3	859.3	Natural	1
LJ10025-1	J10025	J10021	159.9	0.014	859.39	854.3	Circular	1
LJ10025-2	J10025	J10021	159.9	0.015	865.3	860.3	Natural	1
LJ10030-1	J10030	J10025	185.7	0.014	865.3	859.39	Circular	1
LJ10030-2	J10030	J10025	185.7	0.015	870.3	865.3	Natural	1
LJ10074-1	J10074	J10018	27.8	0.014	852.94	852.52	Circular	2
LJ10074-2	J10074	J10018	27.8	0.015	858.02	858.8	Natural	1
LJ10106-1	J10106	J10074	109.3	0.014	853.18	852.94	Circular	2
LJ10106-2	J10106	J10074	109.3	0.015	856.64	858.02	Natural	1
LJ10110-1	J10110	J10106	4	0.014	853.19	853.18	Circular	2
LJ10110-2	J10110	J10106	4	0.015	856.59	856.6	Natural	1
LJ10131-1	J10131	J9986	200.5	0.014	852.21	851.3	Circular	2
LJ10131-2	J10131	J9986	200.5	0.015	860.3	858.3	Natural	1
LJ10190-1	J10190	J10210	75	0.014	861.175	861.06	Circular	1
LJ10190-2	J10190	J10210	75	0.015	864.05	864.3	Natural	1
LJ10191-1	J10191	J9797	351.3	0.014	852.76	851.07	Circular	4.5
LJ10191-2	J10191	J9797	351.3	0.015	860.3	857.3	Natural	1
LJ10210-1	J10210	J10237	48	0.014	861.055	860.98	Circular	0.75
LJ10210-2	J10210	J10237	48	0.015	864.3	864.55	Natural	1
LJ10219-1	J10219	J10337	182.9	0.014	864.54	863.59	Circular	1
LJ10219-2	J10219	J10337	182.9	0.015	869.3	869.3	Natural	1
LJ10220-1	J10220	J10131	200.9	0.014	853.13	852.21	Circular	2
LJ10220-2	J10220	J10131	200.9	0.015	862.3	860.3	Natural	1
LJ10237-1	J10237	J10491	187.5	0.014	860.98	860.68	Circular	0.75
LJ10237-2	J10237	J10491	187.5	0.015	864.55	865.8	Natural	1
LJ10337-1	J10337	J10489	45	0.014	863.59	863.35	Circular	1
LJ10337-2	J10337	J10489	45	0.015	869.3	869.3	Natural	1
LJ10409-1	J10409	J10613	426.5	0.014	879.16	874.78	Circular	1.75
LJ10409-2	J10409	J10613	426.5	0.015	887.3	881.3	Natural	1
LJ10409-3	J10409	J11186	680	0.015	887.3	880.3	Natural	1
LJ10420-1	J10420	J10220	201.1	0.014	854.05	853.13	Circular	2
LJ10420-2	J10420	J10220	201.1	0.015	862.3	862.3	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ10489-1	J10489	J10491	139.4	0.014	861.9	859.7	Circular	1
LJ10489-2	J10489	J10491	139.4	0.015	869.3	865.8	Natural	1
LJ10491-1	J10491	J10495	143.1	0.014	859.14	856.3	Circular	1
LJ10491-2	J10491	J10495	143.1	0.015	865.8	861.8	Natural	1
LJ10492-1	J10492	J10489	29.5	0.014	863.2	861.9	Circular	1
LJ10492-2	J10492	J10489	29.5	0.015	869.3	869.3	Natural	1
LJ10495-1	J10495	J10498	185.5	0.014	856.3	855.74	Circular	1.25
LJ10495-2	J10495	J10498	185.5	0.015	861.8	861.55	Natural	1
LJ10496-1	J10496	J10501	70	0.014	855.3	855.08	Circular	1.5
LJ10496-2	J10496	J10501	70	0.015	861.3	861.55	Natural	1
LJ10496-4	J10496	J10642	34.21	0.015	861.4	861.3	Natural	0.5
LJ10497-1	J10497	J10504	140	0.014	854.74	854.31	Circular	1.5
LJ10497-2	J10497	J10504	140	0.015	861.8	862.3	Natural	1
LJ10498-1	J10498	J10496	144.9	0.014	855.74	855.3	Circular	1.25
LJ10498-2	J10498	J10496	144.9	0.015	861.55	861.3	Natural	1
LJ10501-1	J10501	J10497	109	0.014	855.08	854.74	Circular	1.5
LJ10501-2	J10501	J10497	109	0.015	861.55	861.8	Natural	1
LJ10504-1	J10504	J10420	26	0.014	854.31	854.23	Circular	1.5
LJ10504-2	J10504	J10420	26	0.015	862.3	862.3	Natural	1
LJ10521-1	J10521	J10191	305.8	0.014	854.22	852.76	Circular	4.5
LJ10521-2	J10521	J10191	305.8	0.015	862.3	860.3	Natural	1
LJ10533-1	J10533	J10600	332.4	0.014	866.05	855.77	Circular	1.25
LJ10533-2	J10533	J10600	332.4	0.015	873.3	865.3	Natural	1
LJ10533-3	J10533	J11227	669.58	0.015	873.3	866.3	Natural	1
LJ10584-11	J10584	J10521	16	0.014	854.2	854.17	Circular	3.5
LJ10584-12	J10584	J10420	29.8	0.014	854.23	854.05	Circular	1.5
LJ10584-21	J10584	J10521	16	0.015	862.3	862.3	Natural	1
LJ10584-22	J10584	J10420	29.8	0.015	862.3	862.3	Natural	1
LJ10600-1	J10600	J10521	50.2	0.014	855.77	854.17	Circular	1.5
LJ10600-2	J10600	J10521	50.2	0.015	865.3	862.3	Natural	1
LJ10613-1	J10613	J10632	313.8	0.014	874.78	862.6	Circular	1.75
LJ10613-2	J10613	J10632	313.8	0.015	881.3	869.3	Natural	1
LJ10613-3	J10613	J11159	640.05	0.015	881.3	880.3	Natural	1
LJ10614-1	J10614	J10409	415.5	0.014	880.3	879.16	Circular	2
LJ10614-2	J10614	J10409	415.5	0.015	885.3	887.3	Natural	1
LJ10621-1	J10621	J10614	28.4	0.014	880.65	880.3	Circular	2
LJ10621-2	J10621	J10614	28.4	0.015	885.3	885.3	Natural	1
LJ10621-3	J10621	J11163	640.02	0.015	885.3	881.3	Natural	1
LJ10629-1	J10629	J10642	325.5	0.014	856.21	854.96	Circular	3
LJ10629-2	J10629	J10642	325.5	0.015	862.3	861.3	Natural	1
LJ10629-3	J10629	J9952	654.09	0.015	862.3	860.3	Natural	1
LJ10632-1	J10632	J10629	334.5	0.014	862.6	856.91	Circular	1.75
LJ10632-2	J10632	J10629	334.5	0.015	869.3	862.3	Natural	1
LJ10636-1	J10636	J10584	287	0.014	854.79	854.2	Circular	3.5

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ10636-2	J10636	J10584	287	0.015	861.8	862.3	Natural	1
LJ10642-1	J10642	J10636	28.4	0.014	854.96	854.79	Circular	3.5
LJ10642-2	J10642	J10636	28.4	0.015	861.3	861.8	Natural	1
LJ10642-3	J10496	J10110	509.61	0.015	861.3	856.7	Natural	1
LJ10725-1	J10725	J10584	34	0.014	854.43	854.23	Circular	1.5
LJ10725-2	J10725	J10584	34	0.015	862.3	862.3	Natural	1
LJ10775-1	J10775	J10725	203	0.014	855.65	854.43	Circular	1.5
LJ10775-2	J10775	J10725	203	0.015	863.3	862.3	Natural	1
LJ10810-1	J10810	J10521	327.7	0.014	856.49	854.74	Circular	3.5
LJ10810-2	J10810	J10521	327.7	0.015	863.8	862.3	Natural	1
LJ10842-1	J10842	J10775	192.8	0.014	856.81	855.65	Circular	1.5
LJ10842-2	J10842	J10775	192.8	0.015	864.3	863.3	Natural	1
LJ10967-1	J10967	J10842	204	0.014	858.03	856.81	Circular	1.5
LJ10967-2	J10967	J10842	204	0.015	865.3	864.3	Natural	1
LJ11079-1	J11079	J10967	20.6	0.014	858.15	858.03	Circular	1.5
LJ11079-2	J11079	J10967	20.6	0.015	865.4	865.3	Natural	1
LJ11109-1	J11109	J10810	327.3	0.014	858.23	856.49	Circular	3.5
LJ11109-2	J11109	J10810	327.3	0.015	865.3	863.8	Natural	1
LJ11159-1	J11159	J11170	333.5	0.014	873.31	870.25	Circular	2.25
LJ11159-2	J11159	J11170	333.5	0.015	880.3	876.3	Natural	1
LJ11160-1	J11160	J11186	396	0.014	876.23	874.95	Circular	2
LJ11160-2	J11160	J11186	396	0.015	880.4	880.3	Natural	1
LJ11163-1	J11163	J11160	23	0.014	876.36	876.23	Circular	2
LJ11163-2	J11163	J11160	23	0.015	881.3	880.3	Natural	1
LJ11170-1	J11170	J11176	314.9	0.014	870.25	868.59	Circular	2.5
LJ11170-2	J11170	J11176	314.9	0.015	876.3	875.3	Natural	1
LJ11176-1	J11176	J11211	332.2	0.014	868.59	864.08	Circular	2.5
LJ11176-2	J11176	J11211	332.2	0.015	875.3	871.3	Natural	1
LJ11176-3	J11176	J10629	640.09	0.015	875.3	862.3	Natural	1
LJ11186-1	J11186	J11187	45.5	0.014	874.95	874.93	Circular	2
LJ11186-2	J11186	J11187	45.5	0.015	880.4	880.3	Natural	1
LJ11187-1	J11187	J11159	394.4	0.014	874.93	873.31	Circular	2.25
LJ11187-2	J11187	J11159	394.4	0.015	880.4	880.3	Natural	1
LJ11211-1	J11211	J11213	204.5	0.014	864.08	860.57	Circular	2.5
LJ11211-2	J11211	J11213	204.5	0.015	871.3	867.3	Natural	1
LJ11211-3	J11211	J10642	642	0.015	871.3	861.3	Natural	1
LJ11213-1	J11213	J11220	107.2	0.014	860.57	858.73	Circular	2.5
LJ11213-2	J11213	J11220	107.2	0.015	867.3	865.3	Natural	1
LJ11220-1	J11220	J11109	23	0.014	858.73	858.23	Circular	2.5
LJ11220-2	J11220	J11109	23	0.015	865.4	865.3	Natural	1
LJ11226-1	J11226	J11228	38.01	0.014	863.06	862.43	Circular	2
LJ11226-2	J11226	J11228	38.01	0.015	867.4	867.3	Natural	1
LJ11227-1	J11227	J11232	297.9	0.014	861.13	859.91	Circular	3
LJ11227-2	J11227	J11232	297.9	0.015	866.3	865.3	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ11228-1	J11228	J11230	292	0.014	862.43	861.78	Circular	2
LJ11228-2	J11228	J11230	292	0.015	867.3	866.3	Natural	1
LJ11230-1	J11230	J11227	27.6	0.014	861.78	861.5	Circular	2
LJ11230-2	J11230	J11227	27.6	0.015	866.4	866.3	Natural	1
LJ11315-1	J11315	J11227	24.9	0.014	861.75	861.13	Circular	2
LJ11315-2	J11315	J11227	24.9	0.015	866.4	866.3	Natural	1
LJ11456-1	J11456	J11315	300.6	0.014	862.92	861.75	Circular	2
LJ11456-2	J11456	J11315	300.6	0.015	867.3	866.3	Natural	1
LJ11572-1	J11572	J11456	296.6	0.014	864.23	862.92	Circular	2
LJ11572-2	J11572	J11456	296.6	0.015	868.3	867.3	Natural	1
LJ11637-1	J11637	J11572	18.8	0.014	864.87	864.23	Circular	2
LJ11637-2	J11637	J11572	18.8	0.015	868.3	868.3	Natural	1
LJ2704-1	J11220	J11079	24	0.014	858.3	858.15	Circular	1
LJ2704-2	J11220	J11079	24	0.015	865.4	865.3	Natural	1
LJ2705-1	J11232	J11109	38	0.014	858.19	858.23	Circular	3
LJ2705-2	J11232	J11109	38	0.015	865.4	865.3	Natural	1
LJ2722-1	J9941	J9934	145.4	0.014	852.55	851.69	Circular	3
LJ2722-2	J9941	J9934	145.4	0.015	858.8	858.3	Natural	1
LJ2723-1	J9934	J9874	166	0.014	851.69	850.73	Circular	3
LJ2723-2	J9934	J9874	166	0.015	858.4	858.3	Natural	1
LJ2739-1	J7735	J7576	251	0.014	865.11	851.7	Circular	2.5
LJ2739-2	J7735	J7576	251	0.015	872.92	864.8	Natural	1
LJ2740-1	J6915	J6908	298.1	0.014	819.9	818.93	Circular	1.5
LJ2740-2	J6915	J6908	298.1	0.015	826.9	837.78	Natural	1
LJ2741-1	J6908	J6851	52.4	0.014	818.93	818.76	Circular	1.5
LJ2741-2	J6908	J6851	52.4	0.015	837.78	830.6	Natural	1
LJ2777-1	J6759	J6769	33	0.014	802.173	802.12	Circular	8.5
LJ2777-2	J6759	J6769	33	0.015	830.35	830.35	Natural	1
LJ2790-1	JDOT2	MHNB188-2	418	0.014	829.26	826.35	Circular	3
LJ2790-2	JDOT2	MHNB188-2	418	0.015	836.94	840.1	Natural	1
LJ2791-1	MHNB188-2	CBLN89-1	180	0.014	825.82	824.56	Circular	3.5
LJ2791-2	MHNB188-2	CBLN89-1	180	0.015	840.1	840.74	Natural	1
LJ2792-1	MH17-10-2	MHLN81-3	233.33	0.014	818.4	817	Circular	4
LJ2792-2	MH17-10-2	MHLN81-3	233.33	0.015	827.58	828.5	Natural	1
LJ2793-1	MHLN81-3	MHHN79-3	198	0.014	817	815.8	Circular	4
LJ2793-2	MHLN81-3	MHHN79-3	198	0.015	828.5	829	Natural	1
LJ2794-1	MHHN79-3	CBLN78-1	112	0.014	815.8	814.6	Circular	4
LJ2794-2	MHHN79-3	CBLN78-1	112	0.015	829	830.24	Natural	1
LJ2795-1	CBLN78-1	JDOT3	572	0.014	814.6	805.45	Circular	4
LJ2795-2	CBLN78-1	JDOT3	572	0.015	830.24	818.67	Natural	1
LJ2798-1	CBLN89-1	MH17-10-2	566	0.014	824.56	818.9	Circular	3.5
LJ2798-2	CBLN89-1	MH17-10-2	566	0.015	840.74	827.58	Natural	1
LJ2799-1	JMPRB2	JMPRB1	482	0.014	811.29	808.88	Circular	4
LJ2799-2	JMPRB2	JMPRB1	482	0.015	820.5	818	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ2800-1	JMPRB1	JDUNWOODY	170	0.014	808.37	808.22	Special	4.5
LJ2800-2	JMPRB1	JDUNWOODY	170	0.015	818	815.3	Natural	1
LJ2801-1	JDUNWOODY	TRANS	120	0.014	808.22	808.11	Special	4.5
LJ2801-2	JDUNWOODY	TRANS	120	0.015	815.3	816	Natural	1
LJ2802-1	MH5	J6320	253	0.014	806.26	805.91	Circular	6
LJ2802-2	MH5	J6320	253	0.015	821	825.4	Natural	1
LJ2803-1	TRANS	MH5	330	0.014	806.59	806.26	Circular	6
LJ2803-2	TRANS	MH5	330	0.015	816	821	Natural	1
LJ2804-1	J6595	J6677	154	0.014	804.6	804.38	Circular	7
LJ2804-2	J6595	J6677	154	0.015	828.6	828.6	Natural	1
LJ2805-1	JDOT3	J6721	120	0.014	803.7	803.5	Circular	7.5
LJ2805-2	JDOT3	J6721	120	0.015	818.67	833	Natural	1
LJ2806-1	JDOT4	CBLN78-1	129.56	0.014	818.7	815.1	Circular	3.5
LJ2806-2	JDOT4	CBLN78-1	129.56	0.015	826.3	830.24	Natural	1
LJ3251-1	J3251	J4891	32	0.014	843.7	843.59	Circular	2
LJ3251-2	J3251	J4891	32	0.015	852.3	851.05	Natural	1
LJ4567-1	J4567	J4745	323	0.014	849.59	848.45	Circular	1
LJ4567-2	J4567	J4745	323	0.015	854.3	855.3	Natural	1
LJ4596-1	J4596	J4663	114	0.014	843.05	842.2	Circular	1.25
LJ4596-2	J4596	J4663	114	0.015	847.3	846.3	Natural	1
LJ4597-1	J4597	J4859	349.5	0.014	846.92	844.79	Circular	1.5
LJ4597-2	J4597	J4859	349.5	0.015	851.8	849.4	Natural	1
LJ4663-1	J4663	J4734	252	0.014	840.25	837.88	Circular	1.25
LJ4663-2	J4663	J4734	252	0.015	846.3	844.3	Natural	1
LJ4734-1	J4734	J4764	62.7	0.014	837.88	837.2	Circular	2.5
LJ4734-2	J4734	J4764	62.7	0.015	844.3	844.1	Natural	1
LJ4745-1	J4745	J5104	350	0.014	848.45	845.1	Circular	1
LJ4745-2	J4745	J5104	350	0.015	855.3	852.3	Natural	1
LJ4764-1	J4764	J4937	336	0.014	837.2	836.15	Circular	2.5
LJ4764-2	J4764	J4937	336	0.015	844.1	843.3	Natural	1
LJ4859-1	J4859	J3251	328.3	0.014	844.55	843.7	Circular	2
LJ4859-2	J4859	J3251	328.3	0.015	849.4	852.3	Natural	1
LJ4891-1	J4891	J5085	171.8	0.014	843.7	842.91	Circular	2
LJ4891-2	J4891	J5085	171.8	0.015	851.05	846.3	Natural	1
LJ4937-1	J4937	J5236	357.7	0.014	836.15	835.27	Circular	3
LJ4937-2	J4937	J5236	357.7	0.015	843.3	842.8	Natural	1
LJ4977-1	J4977	J5004	33.8	0.014	846	845.7	Circular	1
LJ4977-2	J4977	J5004	33.8	0.015	852.8	852.3	Natural	1
LJ5004-1	J5004	J5271	339.7	0.014	845.7	838.38	Circular	1
LJ5004-2	J5004	J5271	339.7	0.015	852.3	843.8	Natural	1
LJ5085-1	J5085	J5285	243.2	0.014	842.91	835.15	Circular	2
LJ5085-2	J5085	J5285	243.2	0.015	846.3	841.8	Natural	1
LJ5104-1	J5104	J5168	74.1	0.014	845.1	844.9	Circular	1
LJ5104-2	J5104	J5168	74.1	0.015	852.3	851.8	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ5168-1	J5168	J5205	105.2	0.014	845	843	Circular	1
LJ5168-2	J5168	J5205	105.2	0.015	851.8	850.3	Natural	1
LJ5205-1	J5205	J5293	218.4	0.014	837.86	837	Circular	1.5
LJ5205-2	J5205	J5293	218.4	0.015	850.3	843.8	Natural	1
LJ5207-1	J5207	J5209	30.7	0.014	109.05	103.68	Circular	1.75
LJ5207-2	J5207	J5209	10	0.015	0.05	0	Natural	1
LJ5209-1	J5209	J5475	226.7	0.014	0	0	Circular	1.75
LJ5209-2	J5209	J5475	10	0.015	0.05	0	Natural	1
LJ5212-1	J5212	J5207	262.5	0.014	119.53	109.05	Circular	1.25
LJ5212-2	J5212	J5207	10	0.015	0.05	0	Natural	1
LJ5228-1	J5228	J5236	30.6	0.014	836.54	835.27	Circular	1
LJ5228-2	J5228	J5236	30.6	0.015	843.1	842.8	Natural	1
LJ5236-1	J5236	J5259	49.5	0.014	835.27	833.04	Circular	2.5
LJ5236-2	J5236	J5259	49.5	0.015	842.8	842	Natural	1
LJ5259-1	J5259	J5325	127.4	0.014	833.04	832.59	Circular	2.5
LJ5259-2	J5259	J5325	127.4	0.015	842	841.5	Natural	1
LJ5271-1	J5271	J5293	43	0.014	838.38	837	Circular	1.25
LJ5271-2	J5271	J5293	43	0.015	843.8	843.8	Natural	1
LJ5285-1	J5285	J5411	76.7	0.014	834.6	833.16	Special	2
LJ5285-2	J5285	J5411	76.7	0.015	841.8	840.3	Natural	1
LJ5293-1	J5293	J5363	35.7	0.014	836.67	836.44	Circular	1.5
LJ5293-2	J5293	J5363	35.7	0.015	843.8	843.55	Natural	1
LJ5323-1	J5323	J5228	307	0.014	842	836.54	Circular	1
LJ5323-2	J5323	J5228	307	0.015	849.1	843.1	Natural	1
LJ5325-1	J5325	J5415	52.4	0.014	832.59	832.45	Circular	2.5
LJ5325-2	J5325	J5415	52.4	0.015	841.5	841.3	Natural	1
LJ5363-1	J5363	J5648	315.7	0.014	835.44	832.5	Circular	1.5
LJ5363-2	J5363	J5648	315.7	0.015	843.55	838.39	Natural	1
LJ5411-1	J5411	J5707	328.4	0.014	832.69	829.73	Circular	2.25
LJ5411-2	J5411	J5707	328.4	0.015	840.3	836.3	Natural	1
LJ5415-1	J5415	J5516	171	0.014	832.45	831.74	Circular	2.5
LJ5415-2	J5415	J5516	171	0.015	841.8	840.54	Natural	1
LJ5461-1	J5461	J5516	67.7	0.014	834.4	833.74	Circular	1
LJ5461-2	J5461	J5516	67.7	0.015	841.2	840.54	Natural	1
LJ5475-1	J5475	J5507	34.5	0.014	0	0	Circular	1.75
LJ5475-2	J5475	J5507	10	0.015	0.05	0	Natural	1
LJ5507-1	J5507	J5517	12.9	0.014	0	0	Circular	1.75
LJ5507-2	J5507	J5517	10	0.015	0.05	0	Natural	1
LJ5516-1	J5516	J5580	83.5	0.014	831.74	831.31	Circular	3
LJ5516-2	J5516	J5580	83.5	0.015	840.54	839.67	Natural	1
LJ5517-1	J5517	J5531	16	0.014	0	0	Circular	1.75
LJ5517-2	J5517	J5531	10	0.015	0.05	0	Natural	1
LJ5537-1	J5537	J5540	25.2	0.014	833.6	833.3	Circular	1.5
LJ5537-2	J5537	J5540	25.2	0.015	839.55	839.3	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ5540-1	J5540	J5628	162	0.014	832.31	831	Circular	1.5
LJ5540-2	J5540	J5628	162	0.015	839.3	837.3	Natural	1
LJ5580-1	J5580	J5702	194	0.014	831.31	829.73	Circular	3
LJ5580-2	J5580	J5702	194	0.015	839.67	843.33	Natural	1
LJ5628-1	J5628	J5752	248	0.014	831	829	Circular	1.5
LJ5628-2	J5628	J5752	248	0.015	837.3	835.3	Natural	1
LJ5648-1	J5648	J5696	43.6	0.014	832	831.44	Special	1.75
LJ5648-2	J5648	J5696	43.6	0.015	838.39	838.2	Natural	1
LJ5648-3	J5648	J6131	510.42	0.015	838.39	832.15	Natural	1
LJ5683-1	J5683	J5860	203	0.014	834.44	829	Circular	2
LJ5683-2	J5683	J5860	203	0.015	841.38	836.28	Natural	1
LJ5696-1	J5696	J5926	259.8	0.014	831.44	827.91	Circular	1.75
LJ5696-2	J5696	J5926	259.8	0.015	838.2	833.06	Natural	1
LJ5702-1	J5702	J5905	269	0.014	829.73	828.61	Circular	3
LJ5702-2	J5702	J5905	269	0.015	843.33	854.3	Natural	1
LJ5707-1	J5707	J5752	54.2	0.014	829.73	829.07	Circular	2.25
LJ5707-2	J5707	J5752	54.2	0.015	836.3	835.3	Natural	1
LJ5752-1	J5752	J5935	337.4	0.014	828.42	820.19	Circular	2
LJ5752-2	J5752	J5935	337.4	0.015	835.3	831.3	Natural	1
LJ5758-1	J5758	J5826	67.5	0.014	830.22	829.86	Circular	3
LJ5758-2	J5758	J5826	67.5	0.015	853.04	862	Natural	1
LJ5775-1	J5775	J5891	120.9	0.014	843.16	840.58	Circular	1
LJ5775-2	J5775	J5891	120.9	0.015	846.6	846.6	Natural	1
LJ5826-1	J5826	J5905	149.3	0.014	829.86	828.63	Circular	2.75
LJ5826-2	J5826	J5905	149.3	0.015	862	854.3	Natural	1
LJ5860-1	J5860	J6025	175	0.014	829	827.93	Circular	2.5
LJ5860-2	J5860	J6025	175	0.015	836.28	836.26	Natural	1
LJ5891-1	J5891	J6011	109.4	0.014	840.58	839.5	Circular	1.5
LJ5891-2	J5891	J6011	109.4	0.015	846.6	845.8	Natural	1
LJ5905-1	J5905	J5965	268.3	0.014	828.63	826.4	Circular	2.75
LJ5905-2	J5905	J5965	268.3	0.015	854.3	840.25	Natural	1
LJ5926-1	J5926	J5965	24	0.014	827.91	827.4	Circular	1.75
LJ5926-2	J5926	J5965	24	0.015	833.06	840.25	Natural	1
LJ5935-1	J5935	JDOT4	239.8	0.014	820.19	818.92	Circular	2.5
LJ5935-2	J5935	JDOT4	239.8	0.015	831.3	826.3	Natural	1
LJ5965-1	J5965	J6131	378	0.014	826.4	823.5	Circular	3
LJ5965-2	J5965	J6131	378	0.015	840.25	832.15	Natural	1
LJ5997-1	J5997	J6011	51.9	0.014	837.99	837	Circular	2
LJ5997-2	J5997	J6011	51.9	0.015	845.7	845.8	Natural	1
LJ6011-1	J6011	J6120	155.1	0.014	835.9	834.9	Special	1.88
LJ6011-2	J6011	J6120	155.1	0.015	845.8	842.9	Natural	1
LJ6025-1	J6025	J6079	70.8	0.014	827.93	827.53	Circular	2.5
LJ6025-2	J6025	J6079	70.8	0.015	836.26	836.25	Natural	1
LJ6068-1	J6068	J6164	150	0.014	845.34	844.13	Circular	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ6068-2	J6068	J6164	150	0.015	850.3	850.3	Natural	1
LJ6075-1	J6075	J5997	181.3	0.014	840.46	837.99	Circular	2
LJ6075-2	J6075	J5997	181.3	0.015	848.2	845.7	Natural	1
LJ6079-1	J6079	J6211	141.6	0.014	827.53	827.22	Circular	2.5
LJ6079-2	J6079	J6211	141.6	0.015	836.25	837.3	Natural	1
LJ6120-1	J6120	J6233	130.7	0.014	834.9	833.52	Circular	2.25
LJ6120-2	J6120	J6233	130.7	0.015	842.9	840.1	Natural	1
LJ6131-1	J6131	J6467	263.21	0.014	823.5	820.85	Circular	3
LJ6131-2	J6131	J6467	263.21	0.015	832.15	827.1	Natural	1
LJ6143-1	J6143	J6075	173.4	0.014	842.85	840.46	Circular	2
LJ6143-2	J6143	J6075	173.4	0.015	850.3	848.2	Natural	1
LJ6164-1	J6164	J6143	39.1	0.014	844.13	843.72	Circular	1.5
LJ6164-2	J6164	J6143	39.1	0.015	850.3	850.3	Natural	1
LJ6211-1	J6211	J6483	194.3	0.014	827.22	826.8	Circular	2.5
LJ6211-2	J6211	J6483	194.3	0.015	837.3	838.3	Natural	1
LJ6231-1	J6231	J6227	9.2	0.014	0	0	Circular	3
LJ6231-2	J6231	J6227	10	0.015	0.05	0	Natural	1
LJ6233-1	J6233	J6392	115	0.014	833.52	832.87	Circular	2.25
LJ6233-2	J6233	J6392	115	0.015	840.2	840.1	Natural	1
LJ6237-1	J6237	JDOT4	198	0.014	821.57	818.7	Circular	3
LJ6237-2	J6237	JDOT4	198	0.015	829.3	826.3	Natural	1
LJ6291-1	J6291	J6231	55.1	0.014	0	0	Circular	3
LJ6291-2	J6291	J6231	10	0.015	0.05	0	Natural	1
LJ6320-1	J6320	J6469	100	0.014	805.91	805.77	Circular	6
LJ6320-2	J6320	J6469	100	0.015	825.4	825.4	Natural	1
LJ6366-1	J6366	J6291	72.4	0.014	0	0	Circular	3
LJ6366-2	J6366	J6291	10	0.015	0.05	0	Natural	1
LJ6392-1	J6392	J6501	70	0.014	832.87	831.77	Circular	2.25
LJ6392-2	J6392	J6501	70	0.015	840.1	839.3	Natural	1
LJ6408-1	J6408	J6366	54.5	0.014	0	0	Circular	3
LJ6408-2	J6408	J6366	10	0.015	0.05	0	Natural	1
LJ6450-1	J6450	J6469	211	0.014	809.86	808.2	Circular	3
LJ6450-2	J6450	J6469	211	0.015	821.3	825.4	Natural	1
LJ6463-1	J6463	J6450	51.3	0.014	810.04	809.86	Circular	3
LJ6463-2	J6463	J6450	51.3	0.015	820.3	821.3	Natural	1
LJ6467-1	J6467	J6822	409.9	0.014	817.1	815.38	Circular	5
LJ6467-2	J6467	J6822	409.9	0.015	827.1	824.7	Natural	1
LJ6468-1	J6468	J6463	277.3	0.014	811.37	810.38	Circular	3
LJ6468-2	J6468	J6463	277.3	0.015	819.3	820.3	Natural	1
LJ6469-1	J6469	J6595	100	0.014	804.74	804.6	Circular	7
LJ6469-2	J6469	J6595	100	0.015	825.4	828.6	Natural	1
LJ6471-1	J6471	J6467	150	0.014	822	821.15	Circular	3.5
LJ6471-2	J6471	J6467	150	0.015	829.3	827.1	Natural	1
LJ6477-1	J6477	J6471	265.02	0.014	823.5	822	Circular	3.5

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ6477-2	J6477	J6471	265.02	0.015	830.3	829.3	Natural	1
LJ6483-1	J6483	J6477	345	0.014	826.8	823.5	Circular	3.5
LJ6483-2	J6483	J6477	345	0.015	838.3	830.3	Natural	1
LJ6495-1	J6495	J6483	63.9	0.014	828.59	827.87	Circular	3
LJ6495-2	J6495	J6483	63.9	0.015	838.3	838.3	Natural	1
LJ6501-1	J6501	J6495	315.5	0.014	830.88	828.59	Circular	3
LJ6501-2	J6501	J6495	315.5	0.015	839.3	838.3	Natural	1
LJ6507-1	J6507	J6501	66.6	0.014	831.85	831.77	Circular	1.5
LJ6507-2	J6507	J6501	66.6	0.015	839.3	839.3	Natural	1
LJ6517-1	J6517	J6468	44	0.014	812.77	812.36	Circular	2.25
LJ6517-2	J6517	J6468	44	0.015	819.4	819.3	Natural	1
LJ6518-1	J6518	J6408	79.2	0.014	0	0	Circular	3
LJ6518-2	J6518	J6408	10	0.015	0.05	0	Natural	1
LJ6521-1	J6521	J6518	189.8	0.014	114	111	Circular	3
LJ6521-2	J6521	J6518	10	0.015	0.05	0	Natural	1
LJ6677-1	J6677	JDOT3	86	0.014	804.38	804.22	Circular	7
LJ6677-2	J6677	JDOT3	86	0.015	828.6	818.67	Natural	1
LJ6698-1	J6698	J6517	219.1	0.014	816.86	812.77	Circular	2
LJ6698-2	J6698	J6517	219.1	0.015	826.3	819.3	Natural	1
LJ6705-1	J6705	J6521	235.3	0.014	0	0	Circular	3
LJ6705-2	J6705	J6521	10	0.015	0.05	0	Natural	1
LJ6721-1	J6721	J6759	198.2	0.014	802.5	802.17	Circular	8.5
LJ6721-2	J6721	J6759	198.2	0.015	833	830.35	Natural	1
LJ6762-1	J6762	J6698	101.6	0.014	818.82	816.86	Circular	2
LJ6762-2	J6762	J6698	101.6	0.015	828.3	826.3	Natural	1
LJ6769-1	J6769	J7010	191.8	0.014	802.119	801.8	Circular	8.5
LJ6769-2	J6769	J7010	191.8	0.015	830.35	823.64	Natural	1
LJ6806-1	J6806	J6904	74.7	0.014	835.35	834.56	Circular	3
LJ6806-2	J6806	J6904	74.7	0.015	842.3	842.3	Natural	1
LJ6810-1	J6810	J6806	259	0.014	840.83	837.87	Circular	2.75
LJ6810-2	J6810	J6806	259	0.015	846.3	842.3	Natural	1
LJ6811-1	J6811	J6810	58.3	0.014	841.88	841.1	Circular	2.75
LJ6811-2	J6811	J6810	58.3	0.015	849.3	846.3	Natural	1
LJ6822-1	J6822	J7092	247	0.014	815.38	814.6	Circular	5
LJ6822-2	J6822	J7092	247	0.015	824.7	823.3	Natural	1
LJ6822-4	J6822	J7009	33	0.015	824.7	825.3	Natural	0.5
LJ6851-1	J6851	J6677	146	0.014	817.53	815.19	Circular	3
LJ6851-2	J6851	J6677	146	0.015	830.6	828.6	Natural	1
LJ6871-1	J6871	J6997	293.5	0.014	828.9	828.2	Circular	3.5
LJ6871-2	J6871	J6997	293.5	0.015	835.3	839.3	Natural	1
LJ6876-1	J6876	J6871	52.4	0.014	829.1	828.9	Circular	3.5
LJ6876-2	J6876	J6871	52.4	0.015	835.3	835.3	Natural	1
LJ6883-1	J6883	J6892	58.6	0.014	833.36	832.52	Circular	3
LJ6883-2	J6883	J6892	58.6	0.015	839.3	839.3	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ6892-1	J6892	J6876	332.9	0.014	832.52	829.96	Circular	3
LJ6892-2	J6892	J6876	332.9	0.015	839.3	835.3	Natural	1
LJ6904-1	J6904	J6883	330.5	0.014	834.56	833.36	Circular	3
LJ6904-2	J6904	J6883	330.5	0.015	842.3	839.3	Natural	1
LJ6963-1	J6963	J6721	128.9	0.014	827.82	825.87	Circular	1.5
LJ6963-2	J6963	J6721	128.9	0.015	834.54	833	Natural	1
LJ6997-1	J6997	LORINGPK	300	0.014	828	827.17	Circular	3.5
LJ6997-2	J6997	LORINGPK	300	0.015	839.3	835.5	Natural	1
LJ6999-1	J6999	J6762	119.1	0.014	825.89	820.89	Circular	1.75
LJ6999-2	J6999	J6762	119.1	0.015	836.3	828.3	Natural	1
LJ7000-1	J7000	J7032	365	0.014	874	866.96	Circular	1.25
LJ7000-2	J7000	J7032	365	0.015	875.3	872.8	Natural	1
LJ7009-1	J7009	7009A	117.6	0.014	815.8	812.93	Circular	4
LJ7009-2	J7009	7009A	117.6	0.015	825.3	823.64	Natural	1
LJ7010-1	J7010	J7028	45.3	0.014	800.8	800.7	Circular	10
LJ7010-2	J7010	J7028	45.3	0.015	823.64	823.6	Natural	1
LJ7019(2)	J7019	J7009	155	0.014	820	818.8	Circular	3
LJ7019-11	J7019	J7010	30.2	0.014	814.618	814.3	Circular	6
LJ7019-21	J7019	J7010	30.2	0.015	823.65	823.64	Natural	1
LJ7021-1	J7021	J6851	98.9	0.014	817.53	815.19	Circular	3
LJ7021-2	J7021	J6851	98.9	0.015	846.3	830.6	Natural	1
LJ7027-1	J7027	J7019	22.1	0.014	814.85	814.62	Circular	6
LJ7027-2	J7027	J7019	22.1	0.015	830.84	823.64	Natural	1
LJ7028-1	J7028	J7073	346.1	0.014	800.695	799.89	Circular	10
LJ7028-2	J7028	J7073	346.1	0.015	823.6	823.5	Natural	1
LJ7032-1	J7032	J7053	263	0.014	866.86	861.69	Circular	1.5
LJ7032-2	J7032	J7053	263	0.015	872.8	868.3	Natural	1
LJ7038-1	J7038	J6999	80.7	0.014	838.97	831.91	Circular	1.75
LJ7038-2	J7038	J6999	80.7	0.015	845.2	836.3	Natural	1
LJ7051-1	J7051	J7027	66.4	0.014	821.943	821.5	Circular	6
LJ7051-2	J7051	J7027	66.4	0.015	831.3	830.84	Natural	1
LJ7053-1	J7053	J7067	54.2	0.014	861.69	860.96	Circular	1.5
LJ7053-2	J7053	J7067	54.2	0.015	868.3	866.3	Natural	1
LJ7062-1	J7062	J7051	37	0.014	822.19	821.94	Circular	6
LJ7062-2	J7062	J7051	37	0.015	832.89	831.3	Natural	1
LJ7067-1	J7067	J7070	58.5	0.014	854.97	852.4	Circular	1.5
LJ7067-2	J7067	J7070	58.5	0.015	866.3	861.5	Natural	1
LJ7070-1	J7070	J7038	100	0.014	850.85	839.96	Circular	1.5
LJ7070-2	J7070	J7038	100	0.015	861.5	845.2	Natural	1
LJ7073-1	J7073	J7092	413.7	0.014	799.892	798.94	Circular	10
LJ7073-2	J7073	J7092	413.7	0.015	823.5	823.3	Natural	1
LJ7084-1	J7084	J7021	148.1	0.014	837.71	824.05	Circular	2.75
LJ7084-2	J7084	J7021	148.1	0.015	843.1	846.3	Natural	1
LJ7092-1	J7092	LORINGPK	244.4	0.014	798.94	798.06	Circular	10

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ7092-2	J7092	LORINGPK	244.4	0.015	823.3	835.5	Natural	1
LJ7108-1	J7108	J7084	27.1	0.014	840.18	837.71	Circular	2.75
LJ7108-2	J7108	J7084	27.1	0.015	851.3	843.1	Natural	1
LJ7134-1	J7134	J7180	208.1	0.014	824.85	824.65	Circular	1
LJ7134-2	J7134	J7180	208.1	0.015	833.3	833.3	Natural	1
LJ7153-1	J7153	J7062	107.2	0.014	825.4	823.5	Circular	6
LJ7153-2	J7153	J7062	107.2	0.015	836.9	832.89	Natural	1
LJ7175-1	J7175	J6963	288.6	0.014	842.41	827.82	Circular	1
LJ7175-2	J7175	J6963	288.6	0.015	849.47	834.54	Natural	1
LJ7180-1	J7180	J7092	104	0.014	824.6	820	Circular	2
LJ7180-2	J7180	J7092	104	0.015	833.3	823.3	Natural	1
LJ7242-1	J7242	J7180	141.6	0.014	825.67	824.8	Circular	2
LJ7242-2	J7242	J7180	141.6	0.015	835.8	833.3	Natural	1
LJ7277-1	J7277	J7242	113.8	0.014	825.67	825.67	Circular	2
LJ7277-2	J7277	J7242	113.8	0.015	835.8	835.8	Natural	1
LJ7292-1	J7292	J7277	16.2	0.014	826	825.67	Circular	2
LJ7292-2	J7292	J7277	16.2	0.015	836.3	835.8	Natural	1
LJ7301-1	J7301	J7153	80.6	0.014	828.793	827.3	Circular	6
LJ7301-2	J7301	J7153	80.6	0.015	837	836.9	Natural	1
LJ7325-1	J7325	J7301	18.7	0.014	829.14	828.79	Circular	6
LJ7325-2	J7325	J7301	18.7	0.015	841	836.9	Natural	1
LJ7361-1	J7361	J7372	399	0.014	840.31	840.3	Circular	1.5
LJ7361-2	J7361	J7372	399	0.015	845.4	845.3	Natural	1
LJ7361-3	J7361	J6883	430.8	0.015	845.4	839.3	Natural	1
LJ7363-1	J7363	J7325	67.3	0.014	831.606	831.15	Circular	6
LJ7363-2	J7363	J7325	67.3	0.015	841.1	841	Natural	1
LJ7366-1	J7366	J7108	163.1	0.014	848.7	840.46	Circular	2.5
LJ7366-2	J7366	J7108	163.1	0.015	857.6	851.3	Natural	1
LJ7368-1	J7368	J7292	88.5	0.014	826.1	826	Circular	1.75
LJ7368-2	J7368	J7292	88.5	0.015	836.3	836.3	Natural	1
LJ7372-1	J7372	J7377	399	0.014	837.98	833.3	Circular	1.75
LJ7372-2	J7372	J7377	399	0.015	845.3	840.3	Natural	1
LJ7377-1	J7377	J7368	237.1	0.014	833.3	826.1	Circular	1.75
LJ7377-2	J7377	J7368	237.1	0.015	840.3	836.3	Natural	1
LJ7377-3	J7377	J6876	438.59	0.015	840.3	835.3	Natural	1
LJ7391-1	J7391	J7363	21.3	0.014	831.75	831.61	Circular	6
LJ7391-2	J7391	J7363	21.3	0.015	844.06	841	Natural	1
LJ7411-1	J7411	J7416	72.3	0.014	910.8	910.3	Circular	1
LJ7411-2	J7411	J7416	72.3	0.015	915.3	915.3	Natural	1
LJ7416-1	J7416	J7445	225.7	0.014	910.3	904.7	Circular	1
LJ7416-2	J7416	J7445	225.7	0.015	915.3	909.3	Natural	1
LJ7425-1	J7425	J7464	60.2	0.014	858.8	858.52	Circular	2
LJ7425-2	J7425	J7464	60.2	0.015	862.8	863.3	Natural	1
LJ7445-1	J7445	J7566	245.4	0.014	904.7	897.1	Circular	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ7445-2	J7445	J7566	245.4	0.015	909.3	904.3	Natural	1
LJ7464-1	J7464	J7565	191	0.014	858.52	857.68	Circular	2
LJ7464-2	J7464	J7565	191	0.015	863.3	865.3	Natural	1
LJ7543-1	J7543	J7175	297.8	0.014	852.88	844.16	Circular	1
LJ7543-2	J7543	J7175	297.8	0.015	860.76	849.47	Natural	1
LJ7565-1	J7565	J7570	32.6	0.014	857.68	857.65	Circular	2
LJ7565-2	J7565	J7570	32.6	0.015	865.3	865.3	Natural	1
LJ7566-1	J7566	J7643	270.5	0.014	897.1	887.8	Circular	1
LJ7566-2	J7566	J7643	270.5	0.015	904.3	896.3	Natural	1
LJ7570-1	J7570	J7576	90	0.014	855.97	852.64	Circular	2
LJ7570-2	J7570	J7576	90	0.015	865.3	864.8	Natural	1
LJ7576-1	J7576	J7366	210.3	0.014	851.7	848.7	Circular	2.5
LJ7576-2	J7576	J7366	210.3	0.015	864.8	857.6	Natural	1
LJ7600-1	J7600	J7391	223.4	0.014	832.428	830	Special	8.17
LJ7600-2	J7600	J7391	223.4	0.015	866.72	844.06	Natural	1
LJ7609-1	J7609	J7600	15.3	0.014	832.594	832.43	Special	8.17
LJ7609-2	J7609	J7600	15.3	0.015	866.72	866.72	Natural	1
LJ7611-1	J7611	J7543	81.6	0.014	854.87	852.95	Circular	1
LJ7611-2	J7611	J7543	81.6	0.015	861.59	860.76	Natural	1
LJ7643-1	J7643	J7774	131.6	0.014	887.8	881.8	Circular	1.5
LJ7643-2	J7643	J7774	131.6	0.015	896.3	885.3	Natural	1
LJ7663-1	J7663	J7609	197.8	0.014	834.73	832.59	Special	8.17
LJ7663-2	J7663	J7609	197.8	0.015	866.72	866.72	Natural	1
LJ7737-1	J7737	J7735	90.3	0.014	871.12	868.21	Circular	2
LJ7737-2	J7737	J7735	90.3	0.015	877.3	872.92	Natural	1
LJ7739-1	J7739	J7611	185.1	0.014	0	0	Circular	2.75
LJ7739-2	J7739	J7611	0	0.015	0	0	Natural	1
LJ7774-1	J7774	J7778	162.3	0.014	880.33	873.71	Circular	2
LJ7774-2	J7774	J7778	162.3	0.015	885.3	880.3	Natural	1
LJ7776-1	J7776	J7781	138.7	0.014	893.08	888.83	Circular	2
LJ7776-2	J7776	J7781	138.7	0.015	897.3	894.8	Natural	1
LJ7778-1	J7778	J7737	63.3	0.014	873.71	871.12	Circular	2
LJ7778-2	J7778	J7737	63.3	0.015	880.3	877.3	Natural	1
LJ7781-1	J7781	J7774	164.5	0.014	886.36	880.33	Circular	2
LJ7781-2	J7781	J7774	164.5	0.015	894.8	885.3	Natural	1
LJ7907-1	J7946	J7735	98.84	0.014	868.32	865.34	Circular	1.25
LJ7907-2	J7946	J7735	98.84	0.015	875.3	872.92	Natural	1
LJ7973-1	J7973	J7946	112	0.014	869.98	868.32	Circular	1
LJ7973-2	J7973	J7946	112	0.015	877.3	875.3	Natural	1
LJ7977-1	J7977	J7739	189.3	0.014	0	0	Circular	2.75
LJ7977-2	J7977	J7739	0	0.015	0	0	Natural	1
LJ7993-1	J7993	J7973	82.8	0.014	870.8	869.98	Circular	1
LJ7993-2	J7993	J7973	82.8	0.015	879.3	877.3	Natural	1
LJ8043-1	J8043	J7663	437.2	0.014	834.2	834.73	Special	8.17

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ8043-2	J8043	J7663	437.2	0.015	870.52	866.72	Natural	1
LJ8061-1	J8061	J7977	177.3	0.014	0	0	Circular	2.75
LJ8061-2	J8061	J7977	0	0.015	0	0	Natural	1
LJ8063-1	J8063	J7993	117.8	0.014	875	870.8	Circular	1
LJ8063-2	J8063	J7993	117.8	0.015	882.3	879.3	Natural	1
LJ8085-1	J8085	J8136	30	0.014	878.3	878.1	Circular	1
LJ8085-2	J8085	J8136	30	0.015	886.3	886.3	Natural	1
LJ8108-1	J8108	J7781	358	0.014	891.69	888.74	Circular	1
LJ8108-2	J8108	J7781	358	0.015	897.8	894.8	Natural	1
LJ8136-1	J8136	J8063	101.6	0.014	878.1	875	Circular	1
LJ8136-2	J8136	J8063	101.6	0.015	886.3	882.3	Natural	1
LJ8350-1	JDOT1	J8043	140.9	0.014	834.74	834.2	Special	8.17
LJ8350-2	JDOT1	J8043	140.9	0.015	846.14	870.52	Natural	1
LJ8427-1	J8427	JDOT1	145.1	0.014	835.39	834.74	Special	8.17
LJ8427-2	J8427	JDOT1	145.1	0.015	870.51	846.14	Natural	1
LJ8442-1	J8442	J8427	254.5	0.014	835.67	835.39	Special	8.17
LJ8442-2	J8442	J8427	254.5	0.015	872.3	870.51	Natural	1
LJ8469-1	J8469	J8442	36	0.014	846.66	846.55	Circular	6
LJ8469-2	J8469	J8442	36	0.015	872.3	872.3	Natural	1
LJ8475-1	J8475	J8557	83.2	0.014	891.3	890.3	Circular	1
LJ8475-2	J8475	J8557	83.2	0.015	898.3	897.3	Natural	1
LJ8539-1	J8539	J8442	111.9	0.014	849.3	849.12	Circular	2.75
LJ8539-2	J8539	J8442	111.9	0.015	870.55	872.3	Natural	1
LJ8557-1	J8557	J8558	174.6	0.014	889.53	886.44	Circular	2
LJ8557-2	J8557	J8558	174.6	0.015	897.3	893.8	Natural	1
LJ8558-1	J8558	J8561	125.04	0.014	886.05	884	Circular	2
LJ8558-2	J8558	J8561	125.04	0.015	893.8	890.3	Natural	1
LJ8561-1	J8561	J8596	93.3	0.014	884	883.3	Circular	2
LJ8561-2	J8561	J8596	93.3	0.015	891.3	891.3	Natural	1
LJ8596-1	J8596	J8442	520.95	0.014	883.3	835.67	Circular	2
LJ8625-1	J8625	J8469	190	0.014	847.25	846.66	Circular	6
LJ8625-2	J8625	J8469	190	0.015	869.8	872.3	Natural	1
LJ8626-11	J8626	J8625	15.13	0.014	849.49	847.25	Circular	2.5
LJ8626-12	J8626	J8539	113.4	0.014	849.49	849.3	Circular	2.75
LJ8626-21	J8626	J8625	15.13	0.015	869.8	869.8	Natural	1
LJ8626-22	J8626	J8539	113.4	0.015	869.8	870.55	Natural	1
LJ8810-1	J8810	J8626	141.3	0.014	849.72	849.49	Circular	2.5
LJ8810-2	J8810	J8626	141.3	0.015	867.6	869.8	Natural	1
LJ8838-1	J8838	J8846	232	0.014	903.49	897.7	Circular	1
LJ8838-2	J8838	J8846	232	0.015	910	900.3	Natural	1
LJ8846-1	J8846	J8847	154.5	0.014	897.7	882.74	Circular	1
LJ8846-2	J8846	J8847	154.5	0.015	900.3	889.02	Natural	1
LJ8847-1	J8847	J8877	174.8	0.014	880.84	867.4	Circular	1
LJ8847-2	J8847	J8877	174.8	0.015	889.02	876.13	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ8863-1	J8863	J8810	163.5	0.014	849.98	849.72	Circular	2.5
LJ8863-2	J8863	J8810	163.5	0.015	863.8	867.6	Natural	1
LJ8877-1	J8877	J8863	111.2	0.014	867.4	858	Circular	1
LJ8877-2	J8877	J8863	111.2	0.015	876.13	863.8	Natural	1
LJ8901-1	J8901	J8863	78.6	0.014	850.11	849.98	Circular	2.5
LJ8901-2	J8901	J8863	78.6	0.015	862.3	863.8	Natural	1
LJ9041-1	J9041	J8625	500.4	0.014	848.84	847.25	Circular	6
LJ9041-2	J9041	J8625	500.4	0.015	860.3	869.8	Natural	1
LJ9055-1	J9055	J8901	121	0.014	850.3	850.11	Circular	2.5
LJ9055-2	J9055	J8901	121	0.015	860.6	862.3	Natural	1
LJ9157-11	J9157	J9041	20	0.014	853.05	851.42	Circular	1
LJ9157-12	J9157	J9055	35.6	0.014	850.4	850.3	Circular	1
LJ9157-21	J9157	J9041	20	0.015	861.3	860.3	Natural	1
LJ9157-22	J9157	J9055	35.6	0.015	861.3	860.6	Natural	1
LJ9162-1	J9162	J9167	163.3	0.014	870.84	860.81	Circular	1
LJ9162-2	J9162	J9167	163.3	0.015	876.3	870.3	Natural	1
LJ9162-3	J9162	J9941	659.06	0.015	876.3	858.8	Natural	1
LJ9167-1	J9167	J9157	137.7	0.014	860.81	853.05	Circular	1
LJ9167-2	J9167	J9157	137.7	0.015	870.3	861.8	Natural	1
LJ9174-1	J9174	J9179	182.9	0.014	884.72	876.43	Circular	1
LJ9174-2	J9174	J9179	182.9	0.015	890.3	882.8	Natural	1
LJ9179-1	J9179	J9185	147.7	0.014	876.43	869.52	Circular	1
LJ9179-2	J9179	J9185	147.7	0.015	882.8	875.3	Natural	1
LJ9184-1	J9184	J9189	147.6	0.014	861.66	853.72	Circular	1
LJ9184-2	J9184	J9189	147.6	0.015	868.3	864.3	Natural	1
LJ9185-1	J9185	J9184	155.8	0.014	869.52	861.66	Circular	1
LJ9185-2	J9185	J9184	155.8	0.015	875.3	868.3	Natural	1
LJ9188-1	J9188	J9162	163.3	0.014	879.34	870.84	Circular	1
LJ9188-2	J9188	J9162	163.3	0.015	882.3	876.3	Natural	1
LJ9189-1	J9189	J9041	58.3	0.014	853.72	853.17	Circular	1
LJ9189-2	J9189	J9041	58.3	0.015	864.3	860.3	Natural	1
LJ9190-1	J9190	J9188	170.9	0.014	890.17	879.34	Circular	1
LJ9190-2	J9190	J9188	170.9	0.015	894.3	882.3	Natural	1
LJ9245-1	J9245	J9157	20	0.014	850.33	850.3	Circular	2.25
LJ9245-2	J9245	J9157	20	0.015	860.3	860.3	Natural	1
LJ9373-1	J9373	J9245	181.3	0.014	850.6	850.33	Circular	2.25
LJ9373-2	J9373	J9245	181.3	0.015	859.8	860.3	Natural	1
LJ9419-1	J9419	J9041	330.1	0.014	850.13	850.3	Circular	6
LJ9419-2	J9419	J9041	330.1	0.015	859.3	860.3	Natural	1
LJ9461-1	J9461	J9807	313	0.014	882.82	881.26	Circular	1
LJ9461-2	J9461	J9807	313	0.015	888.3	888.3	Natural	1
LJ9537-1	J9537	J9373	209.5	0.014	850.91	850.6	Circular	2.25
LJ9537-2	J9537	J9373	209.5	0.015	859.3	859.8	Natural	1
LJ9794-1	J9794	J9537	221	0.014	851.24	850.91	Circular	2.25

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJ9794-2	J9794	J9537	221	0.015	858.3	859.3	Natural	1
LJ9797-1	J9797	J9419	334.5	0.014	849.96	850.13	Circular	6
LJ9797-2	J9797	J9419	334.5	0.015	857.3	859.3	Natural	1
LJ9802-1	J9802	J9810	323	0.014	865.57	855.8	Circular	1.75
LJ9802-2	J9802	J9810	323	0.015	870.3	860.3	Natural	1
LJ9807-1	J9807	J9817	408.5	0.014	880.26	876.94	Circular	1.5
LJ9807-2	J9807	J9817	408.5	0.015	887.3	883.3	Natural	1
LJ9809-1	J9809	J9811	24	0.014	880.99	880.95	Circular	1.5
LJ9809-2	J9809	J9811	24	0.015	887.8	887.3	Natural	1
LJ9810-1	J9810	J9952	30.4	0.014	855.8	855.28	Circular	1.75
LJ9810-2	J9810	J9952	30.4	0.015	860.4	860.3	Natural	1
LJ9811-1	J9811	J9807	420	0.014	880.95	880.26	Circular	1.5
LJ9811-2	J9811	J9807	420	0.015	887.4	887.3	Natural	1
LJ9817-1	J9817	J9802	339.3	0.014	876.94	867.24	Circular	1.75
LJ9817-2	J9817	J9802	339.3	0.015	883.3	870.3	Natural	1
LJ9817-3	J9817	J10613	675.27	0.015	876.94	874.78	Natural	1
LJ9874-11	J9874	J9797	20	0.014	850.73	850.3	Circular	3
LJ9874-12	J9874	J9794	11.6	0.014	851.26	851.24	Circular	2.25
LJ9874-21	J9874	J9797	20	0.015	858.3	857.3	Natural	1
LJ9874-22	J9874	J9794	11.6	0.015	858.3	858.3	Natural	1
LJ9885-1	J9885	J9907	284.5	0.014	888.55	884.99	Circular	1
LJ9885-2	J9885	J9907	284.5	0.015	895.3	889.3	Natural	1
LJ9907-1	J9907	J9915	168.5	0.014	884.99	883.43	Circular	1
LJ9907-2	J9907	J9915	168.5	0.015	889.3	888.3	Natural	1
LJ9915-1	J9915	J9809	32	0.014	883.43	882.71	Circular	1
LJ9915-2	J9915	J9809	32	0.015	888.3	887.8	Natural	1
LJ9920-1	J9920	J9923	298.1	0.014	876	866.19	Circular	1
LJ9920-2	J9920	J9923	298.1	0.015	881.3	874.3	Natural	1
LJ9922-1	J9922	J9924	282.9	0.014	863.56	853.02	Circular	1.5
LJ9922-2	J9922	J9924	282.9	0.015	871.3	861.3	Natural	1
LJ9923-1	J9923	J9922	34.5	0.014	865.29	865.24	Circular	1.5
LJ9923-2	J9923	J9922	34.5	0.015	874.3	871.3	Natural	1
LJ9924-1	J9924	J9797	43.4	0.014	853.02	852.73	Circular	1.75
LJ9924-2	J9924	J9797	43.4	0.015	861.3	857.3	Natural	1
LJ9942-1	J9942	J9949	148.6	0.014	852.99	852.6	Circular	3
LJ9942-2	J9942	J9949	148.6	0.015	859.4	859.3	Natural	1
LJ9949-1	J9949	J9941	11.3	0.014	852.6	852.55	Circular	3
LJ9949-2	J9949	J9941	11.3	0.015	859.3	858.8	Natural	1
LJ9952-1	J9952	J9942	157.2	0.014	853.4	852.99	Circular	3
LJ9952-2	J9952	J9942	157.2	0.015	860.3	859.3	Natural	1
LJ9986-1	J9986	J9874	28.2	0.014	851.3	851.26	Circular	2.25
LJ9986-2	J9986	J9874	28.2	0.015	858.4	858.3	Natural	1
LJDOT1-2	JDOT1	JDOT3	1460	0.015	846.14	818.67	Rectangula	10
LJDOT4-3	JDOT4	J7009	33	0.015	825.3	824.8	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LJUNCT	JUNCT	DS6	2985	0.014	734.49	731.5	Circular	14
LL14613-1	L14613	L14897	339.5	0.014	861.09	859.63	Circular	1
LL14613-2	L14613	L14897	339.5	0.015	866.3	865.8	Natural	1
LL14670-1	L14670	L14731	145	0.014	861.9	861.08	Circular	0.75
LL14670-2	L14670	L14731	145	0.015	864.6	865.35	Natural	1
LL14678-1	L14678	L14732	122	0.014	862.49	861.58	Circular	0.75
LL14678-2	L14678	L14732	122	0.015	865.09	865.8	Natural	1
LL14731-1	L14731	L14975	138.4	0.014	861.08	860.3	Circular	0.75
LL14731-2	L14731	L14975	138.4	0.015	865.35	865.55	Natural	1
LL14732-1	L14732	L14992	142	0.014	861.58	860.49	Circular	0.75
LL14732-2	L14732	L14992	142	0.015	865.8	866.59	Natural	1
LL14897-1	L14897	L14984	30.6	0.014	859.63	859.53	Circular	1
LL14897-2	L14897	L14984	30.6	0.015	865.8	865.8	Natural	1
LL14973-1	L14973	L14975	147.4	0.014	858.7	858.26	Circular	1.5
LL14973-2	L14973	L14975	147.4	0.015	865.8	865.55	Natural	1
LL14975-1	L14975	L15000	154.4	0.014	858.26	857.8	Circular	1.5
LL14975-2	L14975	L15000	154.4	0.015	865.55	865.3	Natural	1
LL14984-1	L14984	L14973	33.3	0.014	858.8	858.7	Circular	1.5
LL14984-2	L14984	L14973	33.3	0.015	865.8	865.8	Natural	1
LL14988-1	L15010	L14989	296.3	0.014	855.58	855.45	Circular	3.5
LL14988-2	L15010	L14989	296.3	0.015	862.8	863.3	Natural	1
LL14989-1	L14989	L15020	54.2	0.014	855.45	855.3	Circular	3.5
LL14989-2	L14989	L15020	54.2	0.015	863.3	863.3	Natural	1
LL14992-1	L14992	L14984	129	0.014	860.49	858.8	Circular	0.75
LL14992-2	L14992	L14984	129	0.015	866.59	865.8	Natural	1
LL15000-1	L15000	L15005	321.4	0.014	857.8	856.8	Circular	2.25
LL15000-2	L15000	L15005	321.4	0.015	865.3	862.3	Natural	1
LL15004-1	L15004	L15011	283.5	0.014	856.7	856.2	Circular	3
LL15004-2	L15004	L15011	283.5	0.015	862.3	862.8	Natural	1
LL15005-1	L15005	L15004	34.4	0.014	856.8	856.7	Circular	3
LL15005-2	L15005	L15004	34.4	0.015	862.3	862.3	Natural	1
LL15005-3	L15005	Lake-Clin	586.22	0.015	862.3	861.3	Natural	0.5
LL15011-1	L15011	L15012	9.1	0.014	856.2	855.7	Circular	3
LL15011-2	L15011	L15012	9.1	0.015	862.8	862.8	Natural	1
LL15012-1	L15012	L15010	39.4	0.014	855.7	855.58	Circular	3.5
LL15012-2	L15012	L15010	39.4	0.015	862.8	862.8	Natural	1
LL15020-1	L15020	DS3(31ST)	86	0.014	855.3	854.46	Circular	5
LL15020-2	L15020	DS3(31ST)	86	0.015	863.3	864.65	Natural	1
LL15327-1	L15327	L15020	261.5	0.014	858.06	856.3	Circular	3.5
LL15327-2	L15327	L15020	261.5	0.015	865.05	863.3	Natural	1
LL15410-1	L15533	L15327	333.6	0.014	860.3	858.06	Circular	3.5
LL15410-2	L15533	L15327	333.6	0.015	868.8	865.05	Natural	1
LL15417-1	L15417	L15484	45.6	0.014	865.88	865.74	Circular	1.25
LL15417-2	L15417	L15484	45.6	0.015	869.73	870.21	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LL15484-1	L15484	L15868	133	0.014	865.74	865.08	Circular	1.25
LL15484-2	L15484	L15868	133	0.015	870.21	870.3	Natural	1
LL15576-1	L15576	L15581	58.7	0.014	863.41	863.15	Circular	1.5
LL15576-2	L15576	L15581	58.7	0.015	868.3	868.3	Natural	1
LL15576-3	L15576	L15005	607.03	0.015	868.3	862.3	Natural	1
LL15577-1	L15577	L15578	57.8	0.014	864.26	864.09	Circular	1.5
LL15577-2	L15577	L15578	57.8	0.015	869.3	869.3	Natural	1
LL15577-3	L15577	L15000	609.4	0.015	869.3	865.3	Natural	1
LL15578-1	L15578	L15576	280.7	0.014	864.09	863.41	Circular	1.5
LL15578-2	L15578	L15576	280.7	0.015	869.3	868.3	Natural	1
LL15581-1	L15581	L15591	258.2	0.014	862.89	863.14	Circular	2.5
LL15581-2	L15581	L15591	258.2	0.015	868.3	870.8	Natural	1
LL15583-1	L15583	L15587	278.4	0.014	862.65	861.45	Circular	2.5
LL15583-2	L15583	L15587	278.4	0.015	871.3	868.8	Natural	1
LL15587-1	L15587	L15533	17.9	0.014	861.41	861.37	Circular	2.5
LL15587-2	L15587	L15533	17.9	0.015	868.8	868.8	Natural	1
LL15588-1	L15588	L15583	39.4	0.014	862.8	862.65	Circular	2.5
LL15588-2	L15588	L15583	39.4	0.015	871.3	871.3	Natural	1
LL15588-3	L15588	L15012	611.1	0.015	871.3	862.8	Natural	1
LL15591-1	L15591	L15588	26.7	0.014	863.14	862.8	Circular	2.5
LL15591-2	L15591	L15588	26.7	0.015	870.8	871.3	Natural	1
LL15593-1	L15593	L15605	44.2	0.014	861.86	861.17	Special	3.645
LL15593-2	L15593	L15605	44.2	0.015	868.3	867.8	Natural	1
LL15594-1	L15594	L15593	266.8	0.014	862.15	861.86	Circular	2.75
LL15594-2	L15594	L15593	266.8	0.015	868.3	868.3	Natural	1
LL15595-1	L15596	L15594	51	0.014	862.23	862.15	Circular	2.75
LL15595-2	L15596	L15594	51	0.015	868.3	868.3	Natural	1
LL15596-3	L15596	M15027	610.08	0.015	868.3	865.3	Natural	1
LL15598-1	L15598	L15596	131.6	0.014	862.33	862.23	Circular	2.75
LL15598-2	L15598	L15596	131.6	0.015	869.3	868.3	Natural	1
LL15600-1	L15600	L15598	170.6	0.014	862.56	862.33	Circular	2.75
LL15600-2	L15600	L15598	170.6	0.015	870.3	869.3	Natural	1
LL15614-1	L15605	L15533	303.2	0.014	861.17	860.3	Circular	3.5
LL15614-2	L15605	L15533	303.2	0.015	867.8	868.8	Natural	1
LL15653-1	L15653	L15581	48	0.014	863.36	862.89	Special	1.125
LL15653-2	L15653	L15581	48	0.015	868.3	868.3	Natural	1
LL15854-1	L15854	L15600	90.9	0.014	862.65	862.56	Circular	2.75
LL15854-2	L15854	L15600	90.9	0.015	870.3	870.3	Natural	1
LL15857-1	L15857	L15854	179.5	0.014	862.63	862.65	Circular	2.75
LL15857-2	L15857	L15854	179.5	0.015	869.8	870.3	Natural	1
LL15859-1	L15860	L15857	212.2	0.014	863.31	862.63	Circular	2.75
LL15859-2	L15860	L15857	212.2	0.015	869.05	869.8	Natural	1
LL15861-1	L15861	L15862	24.1	0.014	863.59	863.56	Circular	2
LL15861-2	L15861	L15862	24.1	0.015	869.55	869.3	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LL15862-1	L15862	L15860	56.2	0.014	863.56	863.31	Circular	2.75
LL15862-2	L15862	L15860	56.2	0.015	869.3	869.05	Natural	1
LL15862-3	L15860	M15119	677.27	0.015	869.05	868.3	Natural	1
LL15867-1	L15867	L15868	211.6	0.014	864.9	863.78	Circular	2
LL15867-2	L15867	L15868	211.6	0.015	871.3	870.3	Natural	1
LL15868-1	L15868	L15861	154.6	0.014	863.78	863.59	Circular	2
LL15868-2	L15868	L15861	154.6	0.015	870.3	869.55	Natural	1
LL15870-1	L15870	L15867	35.1	0.014	865.8	865.55	Circular	1.5
LL15870-2	L15870	L15867	35.1	0.015	871.3	871.3	Natural	1
LL15870-3	L15870	M15102	681.29	0.015	871.3	869.3	Natural	1
LL16039-1	L16039	L15598	186	0.014	866.4	864.3	Circular	0.75
LL16039-2	L16039	L15598	186	0.015	872.3	869.3	Natural	1
LL16086-1	L16086	L16039	149	0.014	868.06	866.4	Circular	0.75
LL16086-2	L16086	L16039	149	0.015	871.16	872.3	Natural	1
LL16092-1	L16092	L15653	315.8	0.014	863.88	863.36	Circular	1.5
LL16092-2	L16092	L15653	315.8	0.015	868.8	868.3	Natural	1
LL16228-1	L16228	L16092	285.4	0.014	864.22	863.88	Circular	1.5
LL16228-2	L16228	L16092	285.4	0.015	869.3	868.8	Natural	1
LL16228-3	L16228	N16989	680.46	0.015	869.3	865.3	Natural	1
LL16313-1	L16313	L16228	35.6	0.014	864.64	864.22	Circular	1
LL16313-2	L16313	L16228	35.6	0.015	869.3	869.3	Natural	1
LL16318-1	L16318	L16313	267.5	0.014	865.39	864.64	Circular	1
LL16318-2	L16318	L16313	267.5	0.015	872.3	869.3	Natural	1
LLORINGPK	LORINGPK	DS12	1200	0.014	743.47	742.3	Circular	9
LM13902-1	M13902	M14298	412.1	0.014	866.93	866.11	Circular	1.25
LM13902-2	M13902	M14298	412.1	0.015	873.72	872.08	Natural	1
LM13907-1.	M13907	M14065	237.4	0.014	865.07	864.07	Circular	2
LM13907-2.	M13907	M14065	237.4	0.015	872.3	871.3	Natural	1
LM14065-1.	M14065	M14081	51.1	0.014	864.07	863.9	Circular	2
LM14065-2.	M14065	M14081	51.1	0.015	871.3	871.05	Natural	1
LM14081-1.	M14081	M14234	96.5	0.014	863.9	863.52	Circular	2
LM14081-2.	M14081	M14234	96.5	0.015	871.05	870.8	Natural	1
LM14234-1.	M14234	M14368-1	53.9	0.014	863.32	862.67	Circular	2
LM14234-2.	M14234	M14368-1	53.9	0.015	870.8	870.3	Natural	1
LM14296-2	M14298	MH187	212	0.015	872.08	871.63	Natural	1
LM14347-3.	M14298	M15102	632.23	0.015	872.08	869.3	Natural	1
LM14368-1	M14368-1	M14372	164.9	0.014	862.67	862.29	Circular	2.75
LM14368-2	M14368-1	M14372	164.9	0.015	870.3	869.8	Natural	1
LM14368-3	M14368-1	M15119	624.87	0.015	870.3	868.3	Natural	1
LM14370-1	M14370	M14373	48.6	0.014	861.7	861.57	Circular	3
LM14370-2	M14370	M14373	48.6	0.015	869.2	869.05	Natural	1
LM14370-3	M14370	M15041	612.84	0.015	869.2	867.3	Natural	1
LM14371-1	M14371	M14520	49.6	0.014	861.04	860.72	Circular	3
LM14371-2	M14371	M14520	49.6	0.015	868.3	868.2	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LM14372-1	M14372	M14374	210.7	0.014	862.29	861.8	Circular	2.75
LM14372-2	M14372	M14374	210.7	0.015	869.8	869.3	Natural	1
LM14373-1	M14373	M14371	253.3	0.014	861.57	861.04	Circular	3
LM14373-2	M14373	M14371	253.3	0.015	869.05	868.3	Natural	1
LM14374-1	M14374	M14370	24.9	0.014	861.8	861.7	Circular	2.75
LM14374-2	M14374	M14370	24.9	0.015	869.3	869.2	Natural	1
LM14520-1	M14520	M14656	263.6	0.014	860.72	859.51	Circular	3
LM14520-2	M14520	M14656	263.6	0.015	868.3	866.8	Natural	1
LM14578-1	M14578	MH187	136.4	0.014	865.4	865	Circular	1.25
LM14578-2	M14578	MH187	136.4	0.015	870.3	871.63	Natural	1
LM14656-1	M14656	M14899	272.3	0.014	859.51	858.18	Circular	3
LM14656-2	M14656	M14899	272.3	0.015	866.8	865.3	Natural	1
LM14695-1	M14695	M15026	270.1	0.014	857.35	856	Circular	1
LM14695-2	M14695	M15026	0	0.015	0	0	Natural	1
LM14714-1	M14714	M14877	165	0.014	859.13	858.3	Circular	1.25
LM14714-2	M14714	M14877	0	0.015	0	0	Natural	1
LM14877-1	M14877	M15041	60.1	0.014	858.3	858	Circular	1.25
LM14877-2	M14877	M15041	0	0.015	0	0	Natural	1
LM14899-1	M14899	M15027	35.7	0.014	858.18	857.91	Circular	3
LM14899-2	M14899	M15027	35.7	0.015	865.3	865.2	Natural	1
LM15022-1	M15022	DS3(31ST)	210.9	0.014	851.5	850.2	Circular	4.5
LM15022-2	M15022	DS3(31ST)	210.9	0.015	863.8	864.65	Natural	1
LM15024-1	M15024	M15022	47.6	0.014	851.7	851.5	Circular	3.5
LM15024-2	M15024	M15022	47.6	0.015	863.9	863.8	Natural	1
LM15026-1	M15026	M15024	260.2	0.014	853.1	851.7	Circular	3.5
LM15026-2	M15026	M15024	260.2	0.015	865.3	863.8	Natural	1
LM15027-1	M15027	M15026	24.4	0.014	853.64	853.1	Circular	3.5
LM15027-2	M15027	M15026	24.4	0.015	865.4	865.3	Natural	1
LM15041-1	M15041	M15027	302	0.014	855.35	853.64	Circular	3
LM15041-2	M15041	M15027	302	0.015	867.3	865.3	Natural	1
LM15102-1	M15102	M15104	97.3	0.014	863.8	863.37	Circular	1.75
LM15102-2	M15102	M15104	97.3	0.015	869.3	869.05	Natural	1
LM15104-1	M15104	M15107	96.3	0.014	863.37	862.94	Circular	1.75
LM15104-2	M15104	M15107	96.3	0.015	869.05	868.8	Natural	1
LM15107-1	M15107	M15108	27.7	0.014	862.94	862.82	Circular	2.25
LM15107-2	M15107	M15108	27.7	0.015	868.8	868.7	Natural	1
LM15108-1	M15108	M15112	133.6	0.014	862.82	862.3	Circular	2.25
LM15108-2	M15108	M15112	133.6	0.015	868.7	868.55	Natural	1
LM15112-1	M15112	M15115	48	0.014	862.3	862.02	Circular	2.25
LM15112-2	M15112	M15115	48	0.015	868.55	868.4	Natural	1
LM15115-1	M15115	M15119	39.5	0.014	862.02	861.87	Circular	2.75
LM15115-2	M15115	M15119	39.5	0.015	868.4	868.3	Natural	1
LM15119-1	M15119	M15123	187.5	0.014	861.87	861.16	Circular	2.75
LM15119-2	M15119	M15123	187.5	0.015	868.3	867.8	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LM15123-1	M15123	M15131	225	0.014	861.16	860.3	Circular	2.75
LM15123-2	M15123	M15131	225	0.015	867.8	867.3	Natural	1
LM15131-1	M15131	M15041	56.6	0.014	855.67	855.35	Circular	3
LM15131-2	M15131	M15041	56.6	0.015	867.3	867.3	Natural	1
LMH148-2	V14500-1	MH155A	234	0.015	874.92	874.3	Natural	1
LN16989-1	N16989	N16993	34.4	0.014	862.24	862.09	Circular	1.5
LN16989-2	N16989	N16993	34.4	0.015	865.3	865.3	Natural	1
LN16993-1	N16993	N16996	89.9	0.014	862.09	861.93	Circular	2
LN16993-2	N16993	N16996	89.9	0.015	865.3	866.3	Natural	1
LN16996-1	N16996	N17001	246	0.014	861.93	861.56	Circular	2
LN16996-2	N16996	N17001	246	0.015	866.3	868.3	Natural	1
LN17001-1	N17001	N17014	161.5	0.014	861.56	860.89	Circular	2
LN17001-2	N17001	N17014	161.5	0.015	868.3	868.05	Natural	1
LN17001-3	N17001	O17675	661.09	0.015	868.3	858.3	Natural	1
LN17014-1	N17014	N17019	131.1	0.014	860.89	860.34	Circular	2
LN17014-2	N17014	N17019	131.1	0.015	868.05	867.8	Natural	1
LN17019	N17019	235-0	184	0.014	858.3	846	Circular	2.5
LO17382-1	O17382	DS2(35th)	87	0.014	829.6	829.3	Circular	5.5
LO17382-2	O17382	DS2(35th)	87	0.015	850.6	839.6	Natural	1
LO17590-1	O17590	O17595	59	0.014	855.91	854.2	Circular	1.5
LO17590-2	O17590	O17595	59	0.015	860.08	859.8	Natural	1
LO17593-1	O17593	O17590	306.3	0.014	857.26	855.94	Circular	1
LO17593-2	O17593	O17590	306.3	0.015	864.71	860.08	Natural	1
LO17595-1	O17595	O17606	147.8	0.014	853.67	852.99	Circular	1.5
LO17595-2	O17595	O17606	147.8	0.015	859.8	858.8	Natural	1
LO17606-1	O17606	O17608	147.9	0.014	852.99	852.3	Circular	1.5
LO17606-2	O17606	O17608	147.9	0.015	858.8	858.3	Natural	1
LO17608-1	O17608	O17620	171.3	0.014	852.3	851.35	Circular	2
LO17608-2	O17608	O17620	171.3	0.015	858.3	857.05	Natural	1
LO17608-3	O17608	O18178	648.84	0.015	858.3	851.8	Natural	1
LO17620-1	O17620	O17636	115	0.014	851.35	850.72	Circular	2
LO17620-2	O17620	O17636	115	0.015	857.05	856.8	Natural	1
LO17636-1	O17636	O17854	75.3	0.014	850.72	850.3	Circular	2
LO17636-2	O17636	O17854	75.3	0.015	856.8	856.05	Natural	1
LO17675-1	O17675	O17676	14.2	0.014	851.8	851.71	Circular	1.25
LO17675-2	O17675	O17676	14.2	0.015	858.3	858.3	Natural	1
LO17675-3	O17675	O18191	640.18	0.015	858.3	855.3	Natural	1
LO17676-1	O17676	O17678	165.4	0.014	851.71	850.66	Circular	1.25
LO17676-2	O17676	O17678	165.4	0.015	858.3	857.3	Natural	1
LO17678-1	O17678	O17695	188.9	0.014	850.66	849.5	Circular	1.25
LO17678-2	O17678	O17695	188.9	0.015	857.3	856.3	Natural	1
LO17695-1	O17695	O17382	85.3	0.014	838.556	838.3	Circular	5.5
LO17695-2	O17695	O17382	85.3	0.015	856.3	850.6	Natural	1
LO17930-1	O17854	O17980	289.3	0.014	850.1	848.31	Circular	2.5

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LO17930-2	O17854	O17980	289.3	0.015	856.05	854.3	Natural	1
LO17976-1	O17976	O17695	254.1	0.014	839.23	838.56	Circular	5.5
LO17976-2	O17976	O17695	254.1	0.015	856	856.3	Natural	1
LO17980-1	O17980	O18192	318.8	0.014	848.31	844.47	Circular	2.5
LO17980-2	O17980	O18192	318.8	0.015	854.3	852.3	Natural	1
LO17993-1	O17993	O18007	163	0.014	850.5	849.54	Circular	0.75
LO17993-2	O17993	O18007	163	0.015	854.2	854	Natural	1
LO18000-1	O18000	O18193	195.5	0.014	846.3	845.3	Circular	0.75
LO18000-2	O18000	O18193	195.5	0.015	0	851.3	Natural	1
LO18017-1	O18007	O18370	105	0.014	849.54	848.53	Circular	0.75
LO18017-2	O18007	O18370	105	0.015	854	855.8	Natural	1
LO18063-1	O18197	O17976	401.7	0.014	840.3	839.23	Circular	5.5
LO18063-2	O18197	O17976	401.7	0.015	855.3	856	Natural	1
LO18169-1	O18169	O18170	59.1	0.014	849.55	849.3	Circular	1.25
LO18169-2	O18169	O18170	59.1	0.015	856.67	855.77	Natural	1
LO18170-1	O18170	O18175	134.1	0.014	849.3	847.5	Circular	1.25
LO18170-2	O18170	O18175	134.1	0.015	855.77	853.8	Natural	1
LO18174-1	O18174	O18186	135.3	0.014	842.6	841.7	Circular	5
LO18174-2	O18174	O18186	135.3	0.015	849.3	852.3	Natural	1
LO18175-1	O18175	O18178	131.5	0.014	847.51	845.76	Circular	1.25
LO18175-2	O18175	O18178	131.5	0.015	853.8	851.8	Natural	1
LO18178-1	O18178	O18184	34.9	0.014	845.76	845.3	Circular	1.25
LO18178-2	O18178	O18184	34.9	0.015	851.8	851.7	Natural	1
LO18181-1	O18181	O18197	149.6	0.014	840.77	840.3	Circular	5
LO18181-2	O18181	O18197	149.6	0.015	854.8	855.3	Natural	1
LO18184-1	O18184	O18187	159.8	0.014	845.3	844.66	Circular	3
LO18184-2	O18184	O18187	159.8	0.015	851.7	851.6	Natural	1
LO18186-1	O18186	O18191	180	0.014	841.7	841.3	Circular	5
LO18186-2	O18186	O18191	27.6	0.015	852.3	855.3	Natural	1
LO18187-1	O18187	O18192	188	0.014	844.66	843.9	Circular	3
LO18187-2	O18187	O18192	188	0.015	851.6	851.5	Natural	1
LO18191-1	O18191	O18181	168.4	0.014	841.3	840.77	Circular	5
LO18191-2	O18191	O18181	168.4	0.015	855.3	854.8	Natural	1
LO18192-1	O18192	O18193	135.7	0.014	843.9	843.33	Circular	3.5
LO18192-2	O18192	O18193	135.7	0.015	851.5	851.3	Natural	1
LO18193-1	O18193	O18174	198.6	0.014	843.37	842.6	Circular	3.5
LO18193-2	O18193	O18174	198.6	0.015	851.3	849.3	Natural	1
LO18346-1	O18346	O18186	24	0.014	844.24	844.35	Circular	1
LO18346-2	O18346	O18186	24	0.015	853.9	852.3	Natural	1
LO18370-1	O18370	O18181	32.4	0.014	847.03	846.6	Circular	1
LO18370-2	O18370	O18181	32.4	0.015	855.8	854.8	Natural	1
LO18525-1	O18525	O18174	82	0.014	842.23	842.6	Circular	2.75
LO18525-2	O18525	O18174	82	0.015	850.3	849.3	Natural	1
LO18600-1	O18600	O18346	130.9	0.014	845.3	844.3	Circular	0.75

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LO18600-2	O18600	O18346	130.9	0.015	850	853.9	Natural	1
LO18601-1	O18601	O18370	130.9	0.014	851.06	850.55	Circular	0.75
LO18601-2	O18601	O18370	130.9	0.015	857.3	855.8	Natural	1
LO18618-1	O18618	O18601	123.5	0.014	851.55	851.06	Circular	0.75
LO18618-2	O18618	O18601	123.5	0.015	855.15	857.3	Natural	1
LO18634-1	O18634	O18525	267	0.014	844.31	842.77	Circular	2.75
LO18634-2	O18634	O18525	267	0.015	852.7	850.3	Natural	1
LO18777-1	O18777	O18634	321.6	0.014	847.2	845.3	Circular	2.75
LO18777-2	O18777	O18634	321.6	0.015	855	852.7	Natural	1
LO18890-1	O18890	O18777	27.2	0.014	847.55	847.2	Circular	2.25
LO18890-2	O18890	O18777	27.2	0.015	855.5	855	Natural	1
LO18891-1	O18891	O18890	140.2	0.014	848.26	848	Circular	2.25
LO18891-2	O18891	O18890	140.2	0.015	856.8	855.5	Natural	1
LO18894-1	O18894	O18891	121	0.014	848.7	848.26	Circular	2.25
LO18894-2	O18894	O18891	121	0.015	856.3	856.8	Natural	1
LO18901-1	O18901	O18907	37.1	0.014	851.62	850.4	Circular	1.5
LO18901-2	O18901	O18907	37.1	0.015	856.5	856.3	Natural	1
LO18902-1	O18902	O18777	28.6	0.014	848.63	848.1	Circular	1.5
LO18902-2	O18902	O18777	28.6	0.015	855.3	855	Natural	1
LO18907-1	O18907	O18910	163.3	0.014	850.4	849.87	Circular	1.5
LO18907-2	O18907	O18910	163.3	0.015	856.3	856.6	Natural	1
LO18907-3	O18907	O18178	674.67	0.015	856.3	851.8	Natural	1
LO18910-1	O18910	O18929	107.6	0.014	849.87	849.62	Circular	1.5
LO18910-2	O18910	O18929	107.6	0.015	856.6	856.65	Natural	1
LO18926-1	O18926	O18902	145.8	0.014	850.15	848.63	Circular	1.5
LO18926-2	O18926	O18902	145.8	0.015	857.3	855.3	Natural	1
LO18928-1	O18928	O18894	50.5	0.014	849.21	848.7	Circular	2.25
LO18928-2	O18928	O18894	50.5	0.015	856.7	856.3	Natural	1
LO18928-3	O18928	O18192	676.24	0.015	856.7	852.3	Natural	1
LO18929-1	O18929	O18928	40.6	0.014	849.62	849.21	Circular	2
LO18929-2	O18929	O18928	40.6	0.015	856.65	856.7	Natural	1
LO18930-1	O18930	O18932	40.7	0.014	852.61	851.64	Circular	1.5
LO18930-2	O18930	O18932	40.7	0.015	859.5	859.5	Natural	1
LO18930-3	O18930	O18191	675.02	0.015	859.5	855.3	Natural	1
LO18932-1	O18932	O18926	152.1	0.014	851.64	850.15	Circular	1.5
LO18932-2	O18932	O18926	152.1	0.015	859.5	857.3	Natural	1
LO18936-1	O18936	O18930	141.3	0.014	853.78	852.61	Circular	1
LO18936-2	O18936	O18930	141.3	0.015	859.36	859.5	Natural	1
LO18941-1	O18941	O18936	152.2	0.014	854.51	853.78	Circular	1
LO18941-2	O18941	O18936	152.2	0.015	861	859.36	Natural	1
LO19015-1	O19015	O18907	28.2	0.014	850.4	850.4	Circular	1.5
LO19015-2	O19015	O18907	28.2	0.015	856.34	856.3	Natural	1
LO19212-1	O19212	O18936	130	0.014	855.83	854.16	Circular	0.75
LO19212-2	O19212	O18936	130	0.015	859.63	859.36	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LO19213-1	O19213	O18891	148.7	0.014	851.3	850.3	Circular	0.75
LO19213-2	O19213	O18891	148.7	0.015	855.7	856.8	Natural	1
LO19213-3	O19213	O18777	232.64	0.015	855.7	855	Natural	0.5
LO19272-1	O19272	O19015	371.4	0.014	850.92	850.4	Circular	1.5
LO19272-2	O19272	O19015	371.4	0.015	856.73	856.34	Natural	1
LO19355-1	O19355	O19272	226.6	0.014	851.7	850.92	Circular	1.5
LO19355-2	O19355	O19272	226.6	0.015	857.35	856.73	Natural	1
LO19440-1	O19440	O19446	291.8	0.014	854.5	852.51	Circular	1
LO19440-2	O19440	O19446	291.8	0.015	858.61	857.37	Natural	1
LO19446-1	O19446	O19355	28.9	0.014	852.51	852.33	Circular	1.25
LO19446-2	O19446	O19355	28.9	0.015	857.37	857.35	Natural	1
LO19452-1	O19452	O19355	35	0.014	851.84	851.7	Circular	1.25
LO19452-2	O19452	O19355	35	0.015	857.07	857.35	Natural	1
LO19455-1	O19455	O19452	328.4	0.014	854.03	852	Circular	1
LO19455-2	O19455	O19452	328.4	0.015	858.94	857.07	Natural	1
LP16324-1	P16324	P16327	301	0.014	865.31	864.1	Circular	1
LP16324-2	P16324	P16327	301	0.015	870.8	869.82	Natural	1
LP16324-3	P16324	P17026	655.4	0.015	870.8	865.8	Natural	1
LP16327-1	P16327	P16380	46.6	0.014	863.8	862.2	Circular	1
LP16327-2	P16327	P16380	46.6	0.015	869.82	869.63	Natural	1
LP16380-1	P16380	P16672	93.5	0.014	862.04	861.77	Circular	1.5
LP16380-2	P16380	P16672	93.5	0.015	869.63	868.58	Natural	1
LP16518-1	P16518	P16672	63.7	0.014	863.94	862.38	Circular	1.5
LP16518-2	P16518	P16672	63.7	0.015	869.1	868.58	Natural	1
LP16521-1	P16521	P16533	268.5	0.014	867.75	865.85	Circular	1
LP16521-2	P16521	P16533	268.5	0.015	873.3	871.3	Natural	1
LP16521-3	P16521	P17051	582.7	0.015	873.3	867.53	Natural	1
LP16533-1	P16533	P16518	179.9	0.014	865.15	864.12	Circular	1
LP16533-2	P16533	P16518	179.9	0.015	871.3	869.1	Natural	1
LP16672-1	P16672	P17211	570.01	0.014	860.65	854.03	Circular	1.75
LP16672-2	P16672	P17211	570.01	0.015	868.58	860.5	Natural	1
LP16727-1	P16727	P17046	227	0.014	859.55	858.13	Circular	0.75
LP16727-2	P16727	P17046	227	0.015	863.35	865.95	Natural	1
LP17018-1	P17018	P17024	331.9	0.014	863.95	860.55	Circular	1
LP17018-2	P17018	P17024	331.9	0.015	868.22	866.01	Natural	1
LP17024-1	P17024	P17026	24.9	0.014	860.66	860.54	Circular	1
LP17024-2	P17024	P17026	24.9	0.015	866.01	865.8	Natural	1
LP17026-1	P17026	P17032	277.2	0.014	860.54	854.39	Circular	1.25
LP17026-2	P17026	P17032	277.2	0.015	865.8	860.37	Natural	1
LP17026-3	P17026	P17699	662.02	0.015	865.8	858.3	Natural	1
LP17032-1	P17032	P17211	52.9	0.014	854.29	854.08	Circular	1.5
LP17032-2	P17032	P17211	52.9	0.015	860.37	860.5	Natural	1
LP17041-1	P17041	P17211	68.1	0.014	854.58	854.1	Circular	1.5
LP17041-2	P17041	P17211	68.1	0.015	860.49	860.5	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LP17046-1	P17046	P17041	184	0.014	857.08	854.81	Circular	1.25
LP17046-2	P17046	P17041	184	0.015	865.95	860.49	Natural	1
LP17051-1	P17051	P17046	217	0.014	860.93	858.18	Circular	1
LP17051-2	P17051	P17046	217	0.015	867.53	865.95	Natural	1
LP17051-3	P17051	P17735	661.55	0.015	867.53	860.3	Natural	1
LP17061-1	P17061	P17190	27.5	0.014	857.8	857.65	Circular	2
LP17061-2	P17061	P17190	27.5	0.015	864.4	864.3	Natural	1
LP17190-1	P17190	P17309	300.9	0.014	857.15	855.83	Circular	2
LP17190-2	P17190	P17309	300.9	0.015	864.3	861.8	Natural	1
LP17211-1	P17211	P17719	625.5	0.014	851.47	850.02	Circular	3.5
LP17211-2	P17211	P17719	625.5	0.015	860.5	859.3	Natural	1
LP17272-1	P17272	P17046	175	0.014	858.55	857.43	Circular	0.75
LP17272-2	P17272	P17046	175	0.015	861.45	865.95	Natural	1
LP17309-1	P17309	P17755	349.5	0.014	855.83	854.3	Circular	2
LP17309-2	P17309	P17755	349.5	0.015	861.8	861.3	Natural	1
LP17357-1	P17357	P17432	120	0.014	858.55	857.91	Circular	0.75
LP17357-2	P17357	P17432	120	0.015	862.55	864.3	Natural	1
LP17432-1	P17432	P17813	66	0.014	857.91	857.55	Circular	0.75
LP17432-2	P17432	P17813	66	0.015	864.3	865.95	Natural	1
LP17536-1	P17536	DS2(35th)	178.26	0.014	829.46	829.05	Circular	6
LP17536-2	P17536	DS2(35th)	178.26	0.015	857.3	839.6	Natural	1
LP17587-1	P17587	P17536	8.7	0.014	847.95	847.94	Circular	6
LP17587-2	P17587	P17536	8.7	0.015	857.3	857.3	Natural	1
LP17682-1	P17682	P17587	31.9	0.014	848.03	847.96	Circular	6
LP17682-2	P17682	P17587	31.9	0.015	857.4	857.3	Natural	1
LP17696-1	P17696	P17682	19.1	0.014	848.08	848.03	Circular	6
LP17696-2	P17696	P17682	19.1	0.015	857.3	857.4	Natural	1
LP17699-1	P17699	P17702	53.2	0.014	849.45	849.3	Circular	5.5
LP17699-2	P17699	P17702	53.2	0.015	858.3	858.3	Natural	1.5
LP17702-1	P17702	P17696	268.9	0.014	849.3	848.08	Circular	6
LP17702-2	P17702	P17696	268.9	0.015	858.3	857.3	Natural	1
LP17718-1	P17718	P17719	71.7	0.014	850.52	850.21	Special	3.75
LP17718-2	P17718	P17719	71.7	0.015	859.4	859.3	Natural	1
LP17719-1	P17719	P17699	270.85	0.014	850.21	849.45	Circular	5.5
LP17719-2	P17719	P17699	270.85	0.015	859.3	858.3	Natural	1.5
LP17720-1	P17720	P17718	199.6	0.014	851.13	850.52	Special	3.75
LP17720-2	P17720	P17718	199.6	0.015	859.8	859.3	Natural	1
LP17730-1	P17735	P17720	221.7	0.014	851.8	851.13	Special	3.75
LP17730-2	P17735	P17720	221.7	0.015	860.3	859.8	Natural	1
LP17736-1	P17736	P17735	34.8	0.014	851.93	851.8	Special	3.33
LP17736-2	P17736	P17735	34.8	0.015	860.4	860.3	Natural	1
LP17745-1	P17745	P17736	193.2	0.014	852.64	851.93	Special	3.33
LP17745-2	P17745	P17736	193.2	0.015	860.8	860.3	Natural	1
LP17754-1	P17754	P17772	285.8	0.014	866.25	864.68	Circular	1.25

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LP17754-2	P17754	P17772	285.8	0.015	871.65	870.25	Natural	1
LP17754-3	P17754	P18411	661.15	0.015	871.65	865.3	Natural	1
LP17755-1	P17755	P17745	180.9	0.014	853.3	852.64	Special	3.33
LP17755-2	P17755	P17745	180.9	0.015	861.3	860.8	Natural	1
LP17772-1	P17772	P17914	41.4	0.014	864.11	863.87	Circular	1.75
LP17772-2	P17772	P17914	41.4	0.015	870.25	870.02	Natural	1
LP17801-1	P17801	P17755	61.1	0.014	854.82	854.5	Circular	1.5
LP17801-2	P17801	P17755	61.1	0.015	862.1	861.3	Natural	1
LP17806-1	P17806	P17801	61.7	0.014	856.3	854.82	Circular	0.75
LP17806-2	P17806	P17801	61.7	0.015	863.7	862.1	Natural	1
LP17813-1	P17813	P17806	119.7	0.014	857.55	856.3	Circular	0.75
LP17813-2	P17813	P17806	119.7	0.015	865.95	863.7	Natural	1
LP17912-1	P17912	P17755	45.7	0.014	853.47	853.3	Circular	4.5
LP17912-2	P17912	P17755	45.7	0.015	861.3	861.25	Natural	1
LP17914-1	P17914	P17989	310.5	0.014	863.87	861.48	Circular	1.75
LP17914-2	P17914	P17989	310.5	0.015	870.02	868	Natural	1
LP17950-1	P17950	P17813	100	0.014	860.8	859.8	Circular	0.75
LP17950-2	P17950	P17813	100	0.015	866.1	865.95	Natural	1
LP17959-1	P17959	P17745	177.9	0.014	856.55	855.3	Circular	0.75
LP17959-2	P17959	P17745	177.9	0.015	861.35	860.8	Natural	1
LP17967-1	P17967	P17587	228.1	0.014	852.74	850.3	Circular	2.25
LP17967-2	P17967	P17587	228.1	0.015	858.3	857.3	Natural	1
LP17987-1	P17987	P17989	149	0.014	862.55	860.94	Circular	0.75
LP17987-2	P17987	P17989	149	0.015	868.05	868	Natural	1
LP17988-1	P17988	P17912	307.2	0.014	854.63	853.47	Circular	4.5
LP17988-2	P17988	P17912	307.2	0.015	862.8	861.3	Natural	1
LP17989-1	P17989	P18424	326	0.014	860.33	859.46	Circular	2
LP17989-2	P17989	P18424	326	0.015	868	866.3	Natural	1
LP17996-1	P17996	P17967	203.4	0.014	853.72	852.74	Circular	2.25
LP17996-2	P17996	P17967	203.4	0.015	859.8	858.3	Natural	1
LP18042-1	P18338	P17988	310.2	0.014	855.8	854.63	Circular	4.5
LP18042-2	P18338	P17988	310.2	0.015	864.3	862.8	Natural	1
LP18143-1	P18143	P17996	208	0.014	854.87	853.72	Circular	2.25
LP18143-2	P18143	P17996	208	0.015	861.3	859.8	Natural	1
LP18247-1	P18247	P18143	41.9	0.014	854.54	854.66	Circular	1.5
LP18247-2	P18247	P18143	41.9	0.015	861.4	861.3	Natural	1
LP18255-1	P18255	P18247	138	0.014	855.23	854.54	Circular	1.5
LP18255-2	P18255	P18247	138	0.015	861.8	861.4	Natural	1
LP18260-1	P18260	P18255	152.4	0.014	855.99	855.23	Circular	1.5
LP18260-2	P18260	P18255	152.4	0.015	862.3	861.8	Natural	1
LP18270-1	P18270	P18260	28	0.014	856.2	855.99	Circular	1.5
LP18270-2	P18270	P18260	28	0.015	862.4	862.3	Natural	1
LP18354-1	P18354	P18363	58.8	0.014	858.72	858.57	Circular	1.5
LP18354-2	P18354	P18363	58.8	0.015	865.3	865.4	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LP18354-3	P18354	P17735	659.1	0.015	865.3	860.3	Natural	1
LP18363-1	P18363	P18383	172.4	0.014	858.39	857.6	Circular	1.5
LP18363-2	P18363	P18383	172.4	0.015	865.4	865.8	Natural	1
LP18383-1	P18383	P18338	213.5	0.014	857.6	856.46	Circular	1.5
LP18383-2	P18383	P18338	213.5	0.015	865.8	864.3	Natural	1
LP18391-1	P18391	P18338	28.3	0.014	856.53	855.61	Circular	4
LP18391-2	P18391	P18338	28.3	0.015	864.4	864.3	Natural	1
LP18398-1	P18398	P18391	182.7	0.014	857.34	856.53	Circular	4
LP18398-2	P18398	P18391	182.7	0.015	864.4	864.3	Natural	1
LP18407-1	P18407	P18398	7.7	0.014	857.45	857.34	Circular	4
LP18407-2	P18407	P18398	7.7	0.015	864.4	864.3	Natural	1
LP18411-1	P18411	P18407	203.3	0.014	858.37	857.45	Circular	4
LP18411-2	P18411	P18407	203.3	0.015	865.3	864.3	Natural	1
LP18412-1	P18412	P18411	21.6	0.014	858.8	858.37	Circular	4
LP18412-2	P18412	P18411	21.6	0.015	865.4	865.3	Natural	1
LP18423-1	P18424	P18412	289.8	0.014	859.03	858.8	Circular	4
LP18423-2	P18424	P18412	289.8	0.015	866.3	865.3	Natural	1
LP18425-1	P18426	P18424	34.3	0.014	859.06	859.03	Circular	4
LP18425-2	P18426	P18424	34.3	0.015	866.4	866.3	Natural	1
LP18433-1	P18433	P18434	20.3	0.014	860.8	860.26	Circular	3.5
LP18433-2	P18433	P18434	20.3	0.015	866.9	866.8	Natural	1
LP18434-1	P18434	P18426	299.6	0.014	860.26	859.06	Circular	3.5
LP18434-2	P18434	P18426	299.6	0.015	866.8	866.3	Natural	1
LP18440-1	P18440	P18442	24.5	0.014	861.58	861.48	Circular	3
LP18440-2	P18440	P18442	24.5	0.015	867.4	867.3	Natural	1
LP18442-1	P18442	P18433	299.1	0.014	861.48	860.8	Circular	3.5
LP18442-2	P18442	P18433	299.1	0.015	867.3	866.8	Natural	1
LP18447-1	P18447	P18440	136.8	0.014	861.77	861.58	Circular	3
LP18447-2	P18447	P18440	136.8	0.015	867.4	867.3	Natural	1
LP18448-1	P18448	P18447	128.9	0.014	861.95	861.77	Circular	3
LP18448-2	P18448	P18447	128.9	0.015	867.8	867.3	Natural	1
LP18450-1	P18450	P18448	27.9	0.014	861.99	861.95	Circular	3
LP18450-2	P18450	P18448	27.9	0.015	868.3	867.8	Natural	1
LP18451-1	P18451	P18450	51.3	0.014	862.34	861.81	Special	3.646
LP18451-2	P18451	P18450	51.3	0.015	868.4	868.3	Natural	1
LP18454-1	P18454	P18455	20.6	0.014	863.27	863.43	Circular	2
LP18454-2	P18454	P18455	20.6	0.015	869.4	869.3	Natural	1
LP18455-1	P18455	P18451	284.9	0.014	863.43	862.4	Circular	2.75
LP18455-2	P18455	P18451	284.9	0.015	869.3	868.3	Natural	1
LP18460-1	P18460	P18461	35.7	0.014	866	865.79	Circular	2
LP18460-2	P18460	P18461	35.7	0.015	870.4	870.3	Natural	1
LP18461-1	P18461	P18454	309.2	0.014	865.46	864.73	Circular	2
LP18461-2	P18461	P18454	309.2	0.015	870.3	869.3	Natural	1
LP18479-1	P18479	P18270	42.2	0.014	856.87	856.2	Circular	1.5

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LP18479-2	P18479	P18270	42.2	0.015	862.64	862.3	Natural	1
LP18497-1	P18497	P18338	32.8	0.014	857.5	856.39	Circular	2.5
LP18497-2	P18497	P18338	32.8	0.015	864.3	864.3	Natural	1
LP18503-1	P18503	P18479	13.7	0.014	857	856.87	Circular	1.25
LP18503-2	P18503	P18479	13.7	0.015	863.1	862.64	Natural	1
LP18506-1	P18506	P18503	110.8	0.014	857.84	857	Circular	1.25
LP18506-2	P18506	P18503	110.8	0.015	864.65	863.1	Natural	1
LP18510-1	P18510	P18506	140.9	0.014	860.12	859	Circular	1.25
LP18510-2	P18510	P18506	140.9	0.015	866.57	864.65	Natural	1
LP18589-1	P18589	P18434	50.9	0.014	861.65	861.07	Circular	1
LP18589-2	P18589	P18434	50.9	0.015	867.3	866.8	Natural	1
LP18603-1	P18603	P18506	112	0.014	859.3	857.84	Circular	0.75
LP18603-2	P18603	P18506	112	0.015	864	864.65	Natural	1
LP18610-1	P18610	P18143	221.7	0.014	856.25	854.87	Circular	1.5
LP18610-2	P18610	P18143	221.7	0.015	862.3	861.3	Natural	1
LP18653-1	P18653	P18589	268.6	0.014	864.3	861.65	Circular	1
LP18653-2	P18653	P18589	268.6	0.015	873.3	867.3	Natural	1
LP18658-1	P18658	P18681	100.1	0.014	867.793	866.27	Circular	0.75
LP18658-2	P18658	P18681	100.1	0.015	871.34	872.3	Natural	1
LP18670-1	P18670	P18497	337.2	0.014	859.78	858.48	Circular	2.5
LP18670-2	P18670	P18497	337.2	0.015	868.3	864.3	Natural	1
LP18671-1	P18671	P18699	150	0.014	854.8	854.05	Circular	0.75
LP18671-2	P18671	P18699	150	0.015	0	0	Natural	1
LP18678-1	P18678	P18610	229.1	0.014	857.3	856.25	Circular	1.5
LP18678-2	P18678	P18610	229.1	0.015	863.8	862.3	Natural	1
LP18681-1	P18681	P19003	217.9	0.014	866.27	863.4	Circular	0.75
LP18681-2	P18681	P19003	217.9	0.015	872.3	869.47	Natural	1
LP18699-1	P18699	P18882	122.5	0.014	854.05	853.4	Circular	0.75
LP18699-2	P18699	P18882	122.5	0.015	0	0	Natural	1
LP18748-1	P18950	P18678	255.2	0.014	858.17	857.3	Circular	1.5
LP18748-2	P18950	P18678	255.2	0.015	865.6	863.8	Natural	1
LP18795-1	P18795	P18670	265.5	0.014	860.81	859.78	Circular	2.5
LP18795-2	P18795	P18670	265.5	0.015	867.3	868.3	Natural	1
LP18854-1	P18854	P18653	307	0.014	866.68	864.3	Circular	1
LP18854-2	P18854	P18653	307	0.015	874.3	873.3	Natural	1
LP18882-1	P18882	P19066	18.4	0.014	853.4	853.3	Circular	0.75
LP18882-2	P18882	P19066	18.4	0.015	0	866.1	Natural	1
LP18943-1	P18943	P18795	19.8	0.014	860.89	860.81	Circular	2.5
LP18943-2	P18943	P18795	19.8	0.015	867.3	867.3	Natural	1
LP18949-1	P18953	P18950	97.01	0.014	859.28	858.6	Circular	1.25
LP18949-2	P18953	P18950	97.01	0.015	865.9	865.6	Natural	1
LP19003-1	P19003	P18943	206.6	0.014	862.3	861.3	Circular	1
LP19003-2	P19003	P18943	206.6	0.015	869.47	867.3	Natural	1
LP19019-1	P19019	P19066	143.6	0.014	860.4	859.6	Circular	1.25

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LP19019-2	P19019	P19066	143.6	0.015	866.5	866.1	Natural	1
LP19021-1	P19021	P19019	43.9	0.014	860.7	860.4	Circular	1.25
LP19021-2	P19021	P19019	43.9	0.015	866.6	866.5	Natural	1
LP19021-3	P19021	P18479	640.18	0.015	866.5	862.64	Natural	1
LP19051-1	P19051	P19021	132.5	0.014	861.59	860.7	Circular	1
LP19051-2	P19051	P19021	132.5	0.015	866.8	866.6	Natural	1
LP19066-1	P19066	P18953	48.5	0.014	859.6	859.28	Circular	1.25
LP19066-2	P19066	P18953	48.5	0.015	866.1	865.9	Natural	1
LP19070-1	P19070	P19051	219.6	0.014	862.04	861.59	Circular	1
LP19070-2	P19070	P19051	219.6	0.015	867.3	866.8	Natural	1
LP19070-3	P19070	P18510	638.42	0.015	867.3	866.57	Natural	1
LP19092-1	P19092	P18943	35.5	0.014	863.31	861.91	Circular	1
LP19092-2	P19092	P18943	35.5	0.015	867.4	867.3	Natural	1
LP19097-1	P19097	P19092	188.2	0.014	866.91	863.31	Circular	1
LP19097-2	P19097	P19092	188.2	0.015	870.8	867.4	Natural	1
LP19101-1	P19101	P19097	243.2	0.014	870.1	866.91	Circular	1
LP19101-2	P19101	P19097	243.2	0.015	874.3	870.8	Natural	1
LP19101-3	P19101	P18411	669.54	0.015	874.3	865.3	Natural	1
LP19131-1	P19131	P19137	135.2	0.014	869.75	868.65	Circular	1
LP19131-2	P19131	P19137	135.2	0.015	874.8	874.3	Natural	1
LP19137-1	P19137	P18854	50.5	0.014	868.65	866.68	Circular	1
LP19137-2	P19137	P18854	50.5	0.015	874.3	874.3	Natural	1
LP19143-1	P19143	P19145	136.4	0.014	871.83	871.15	Circular	1
LP19143-2	P19143	P19145	136.4	0.015	876.05	875.8	Natural	1
LP19144-1	P19144	P19131	203.6	0.014	870.26	869.75	Circular	1
LP19144-2	P19144	P19131	203.6	0.015	875.3	874.8	Natural	1
LP19144-3	P19144	P18442	673.31	0.015	875.3	867.3	Natural	1
LP19145-1	P19145	P19144	122.9	0.014	871.15	871.08	Circular	1
LP19145-2	P19145	P19144	122.9	0.015	875.8	875.3	Natural	1
LP19147-1	P19147	P19143	86.6	0.014	872.28	871.83	Circular	1
LP19147-2	P19147	P19143	86.6	0.015	876.55	876.05	Natural	1
LP19147-3	P19147	P18451	671.07	0.015	876.55	868.3	Natural	1
LP19148-1	P19148	P19149	150.8	0.014	873.5	872.72	Circular	1
LP19148-2	P19148	P19149	150.8	0.015	877.3	876.8	Natural	1
LP19148-3	P19148	P18454	671.07	0.015	877.3	869.3	Natural	1
LP19149-1	P19149	P19147	134.3	0.014	872.72	872.28	Circular	1
LP19149-2	P19149	P19147	134.3	0.015	876.8	876.55	Natural	1
LP19155-1	P19155	P18943	35.5	0.014	862.7	862.41	Circular	1
LP19155-2	P19155	P18943	35.5	0.015	867.79	867.3	Natural	1
LP19214-1	P19214	P19155	117.2	0.014	863.5	862.7	Circular	1
LP19214-2	P19214	P19155	117.2	0.015	867.44	867.79	Natural	1
LR113-1	R113	R94	360.9	0.014	830.07	829.79	Special	4.5
LR113-2	R113	R94	360.9	0.015	837.3	838.8	Natural	1
LR12-1	R12	R13	273.3	0.014	850.58	845.14	Circular	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LR121-1	R126	R124	139.8	0.014	836.17	833.58	Circular	1.25
LR121-2	R126	R124	139.8	0.015	843.3	840.7	Natural	1
LR12-2	R12	R13	273.3	0.015	859.74	852.05	Natural	1
LR124-1	R124	R127	137.4	0.014	833.58	831.05	Circular	1.25
LR124-2	R124	R127	137.4	0.015	840.7	837.3	Natural	1
LR127-1	R127	R128	42	0.014	831.05	830.55	Circular	1.25
LR127-2	R127	R128	42	0.015	837.3	836.3	Natural	1
LR128-1	R128	R132	280	0.014	830.55	830.34	Special	3.75
LR128-2	R128	R132	280	0.015	836.3	836.3	Natural	1
LR130-1	R130	R126	65.5	0.014	836.86	836.17	Circular	1.25
LR130-2	R130	R126	65.5	0.015	844.5	843.3	Natural	1
LR13-1	R13	R33	298.8	0.014	845.14	839.3	Circular	1
LR13-2	R13	R33	298.8	0.015	852.05	845.91	Natural	1
LR132-1	R132	R136	53.3	0.014	830.34	830.3	Circular	5
LR132-2	R132	R136	53.3	0.015	836.3	836.3	Natural	1
LR134-1	R134	R130	308.7	0.014	856.3	838.61	Circular	1
LR134-2	R134	R130	308.7	0.015	872.8	844.5	Natural	1
LR137-1	R136	R139	286.9	0.014	830.3	830.07	Special	4.5
LR137-2	R136	R139	286.9	0.015	836.3	837.3	Natural	1
LR139-1	R139	R113	27.3	0.014	830.07	830.05	Special	4.5
LR139-2	R139	R113	27.3	0.015	837.3	837.4	Natural	1
LR14	R14	R43	150.5	0.014	841.8	840.3	Circular	0.75
LR140-1	R140	R113	172.6	0.014	833.43	832.3	Circular	1.75
LR140-2	R140	R113	172.6	0.015	839.3	837.3	Natural	1
LR141-1	R141	R140	144.3	0.014	834.37	833.43	Circular	1.75
LR141-2	R141	R140	144.3	0.015	841.3	839.3	Natural	1
LR142-1	R142	R141	48.2	0.014	836.21	834.4	Circular	1
LR142-2	R142	R141	48.2	0.015	841.3	841.3	Natural	1
LR143-1	R143	R142	143.9	0.014	837.87	836.21	Circular	1
LR143-2	R143	R142	143.9	0.015	845.8	841.3	Natural	1
LR144-1	R144	R143	157.4	0.014	844.99	837.89	Circular	1
LR144-2	R144	R143	157.4	0.015	850.3	845.8	Natural	1
LR153-1	R161	R128	49.1	0.014	830.55	830.46	Special	2.6
LR153-2	R161	R128	49.1	0.015	837.3	836.3	Natural	1
LR168-1	R175	R161	584.3	0.014	831.22	830.55	Circular	4.5
LR168-2	R175	R161	584.3	0.015	837.8	837.3	Natural	1
LR172-1	R172	R200	100.5	0.014	837.3	836.72	Circular	0.75
LR172-2	R172	R200	100.5	0.015	841.1	841	Natural	1
LR191-1	R191	R175	305.9	0.014	831.26	831.05	Circular	4.5
LR191-2	R191	R175	305.9	0.015	837.5	837.8	Natural	1
LR193-1	R193	R175	46.8	0.014	831.55	831.3	Circular	1.75
LR193-2	R193	R175	46.8	0.015	837.85	837.8	Natural	1
LR194-1	R194	R195	37.7	0.014	832	831.46	Circular	3
LR194-2	R194	R195	37.7	0.015	837.3	837.4	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LR195-1	R195	R191	23.5	0.014	831.46	831.3	Circular	3
LR195-2	R195	R191	23.5	0.015	837.4	837.5	Natural	1
LR196-1	R196	R193	136.9	0.014	832	831.55	Circular	1.5
LR196-2	R196	R193	136.9	0.015	837.85	837.85	Natural	1
LR197-1	R197	R199	35.1	0.014	846.83	846.16	Circular	1.25
LR197-2	R197	R199	35.1	0.015	852.8	849.8	Natural	1
LR198-1	R198	R196	123	0.014	832.4	832	Circular	1.5
LR198-2	R198	R196	123	0.015	838.1	837.85	Natural	1
LR199-1	R199	R200	148	0.014	846.16	838.69	Circular	1.25
LR199-2	R199	R200	148	0.015	849.8	844.9	Natural	1
LR200-1	R200	R194	148.9	0.014	836.69	832.2	Circular	1.25
LR200-2	R200	R194	148.9	0.015	844.9	837.3	Natural	1
LR201-1	R201	R198	45.7	0.014	832.55	832.4	Circular	1.5
LR201-2	R201	R198	45.7	0.015	838.3	838.1	Natural	1
LR202-1	R202	R201	24.3	0.014	833.11	832.55	Circular	1
LR202-2	R202	R201	24.3	0.015	838.3	838.3	Natural	1
LR205-1	R205	R202	139.8	0.014	836.34	833.11	Circular	1
LR205-2	R205	R202	139.8	0.015	842.35	838.3	Natural	1
LR206-1	R206	R205	171.1	0.014	840.3	836.34	Circular	1
LR206-2	R206	R205	171.1	0.015	846.3	842.35	Natural	1
LR206-3	R206	R113	678	0.015	846.3	837.3	Natural	1
LR231-1	R231	R194	201.5	0.014	832.46	832.02	Circular	2.5
LR231-2	R231	R194	201.5	0.015	837.63	837.3	Natural	1
LR232-1	R232	R231	210	0.014	832.84	832.46	Circular	2.5
LR232-2	R232	R231	210	0.015	837.96	837.63	Natural	1
LR233-1	R233	R234	97.3	0.014	836.3	835.9	Circular	0.75
LR233-2	R233	R234	97.3	0.015	839.8	840.3	Natural	1
LR234-1	R234	R268	139.6	0.014	835.9	835.3	Circular	0.75
LR234-2	R234	R268	139.6	0.015	840.3	840.9	Natural	1
LR242-1	R242	R232	216.5	0.014	833.16	832.84	Circular	2.5
LR242-2	R242	R232	216.5	0.015	839.07	837.96	Natural	1
LR254-1	R254	R242	74.6	0.014	833.34	832.9	Circular	1.5
LR254-2	R254	R242	74.6	0.015	839.1	839.07	Natural	1
LR255-1	R255	R254	325.2	0.014	835.24	833.34	Circular	1.5
LR255-2	R255	R254	325.2	0.015	839.73	839.1	Natural	1
LR256-1	R261	R255	264	0.014	836.36	835.25	Circular	1.25
LR256-2	R261	R255	264	0.015	840.65	839.73	Natural	1
LR258-1	R258	R259	152.2	0.014	849.3	847.22	Circular	1
LR258-2	R258	R259	152.2	0.015	855.3	853.21	Natural	1
LR259-1	R259	R260	141.1	0.014	847.22	845.3	Circular	1
LR259-2	R259	R260	141.1	0.015	853.21	851.3	Natural	1
LR260-1	R260	R262	56.4	0.014	844.8	844.05	Circular	1.25
LR260-2	R260	R262	56.4	0.015	851.3	851.3	Natural	1
LR262-1	R262	R264	15.8	0.014	844.05	843.7	Circular	1.25

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LR262-2	R262	R264	15.8	0.015	851.3	851.3	Natural	1
LR263-1	R263	R261	46.1	0.014	837	836.94	Circular	1
LR263-2	R263	R261	46.1	0.015	840.3	840.65	Natural	1
LR264-1	R264	R265	133.8	0.014	843.7	839.55	Circular	1.25
LR264-2	R264	R265	133.8	0.015	851.3	846.55	Natural	1
LR265-1	R265	R266	153.2	0.014	839.55	834.8	Circular	1.25
LR265-2	R265	R266	153.2	0.015	846.55	841.3	Natural	1
LR266-1	R266	R268	154.2	0.014	834.8	833.99	Circular	2
LR266-2	R266	R268	154.2	0.015	841.3	840.9	Natural	1
LR267-1	R267	R242	20.1	0.014	833.4	833	Circular	2
LR267-2	R267	R242	20.1	0.015	839.15	839.07	Natural	1
LR268-1	R268	R267	90.9	0.014	833.99	833.4	Circular	2
LR268-2	R268	R267	90.9	0.015	840.9	839.15	Natural	1
LR33-1	R33	R69	36.7	0.014	839.3	838.93	Circular	1
LR33-2	R33	R69	36.7	0.015	845.91	845.3	Natural	1
LR43	R43	R48	125.5	0.014	840.3	833.76	Circular	0.75
LR48-1	R48	R58	29.2	0.014	833.5	833.06	Circular	1.25
LR48-2	R48	R58	29.2	0.015	840	840	Natural	1
LR49-1	R49	R51	51.6	0.014	847.4	847.17	Circular	2
LR49-2	R49	R51	51.6	0.015	858.3	858.3	Natural	1
LR50-1	R50	R52	33.9	0.014	845.2	844.66	Circular	1.75
LR50-2	R50	R52	33.9	0.015	854.7	854.7	Natural	1
LR50-3	R50	R127	648	0.015	854.7	837.3	Natural	1
LR51-1	R51	R50	290.7	0.014	847.17	845.2	Circular	2
LR51-2	R51	R50	290.7	0.015	858.3	854.7	Natural	1
LR52-1	R52	R56	297.4	0.014	844.66	840.61	Circular	1.75
LR52-2	R52	R56	297.4	0.015	854.7	847.8	Natural	1
LR53-1	R53	R49	274.2	0.014	849.12	847.4	Circular	2
LR53-2	R53	R49	274.2	0.015	856.3	858.3	Natural	1
LR54-1	R54	R82	25	0.014	827.73	827.28	Circular	1.75
LR54-2	R54	R82	25	0.015	834.3	834.55	Natural	1
LR56-1	R56	R57	36.7	0.014	840.61	840.04	Circular	2
LR56-2	R56	R57	36.7	0.015	847.8	847.3	Natural	1
LR56-3	R56	R136	651.56	0.015	847.8	836.3	Natural	1
LR57-1	R57	R60	154.2	0.014	840.04	838.33	Circular	2
LR57-2	R57	R60	154.2	0.015	847.3	845.7	Natural	1
LR58-1	R58	R78	45.8	0.014	833.06	832.55	Circular	1.25
LR58-2	R58	R78	45.8	0.015	840	839.74	Natural	1
LR60-1	R60	R61	138.3	0.014	833.51	833.18	Circular	2.25
LR60-2	R60	R61	138.3	0.015	845.7	844.3	Natural	1
LR6-1	R6	R9	48.3	0.014	853	852.88	Special	1.125
LR61-1	R61	R77	35.1	0.014	833.18	832.78	Circular	2.25
LR61-2	R61	R77	35.1	0.015	844.3	844.3	Natural	1
LR6-2	R6	R9	48.3	0.015	860.55	860.3	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LR66-1	R77	R69	331.2	0.014	829.63	829.53	Circular	6.5
LR66-2	R77	R69	331.2	0.015	844.3	845.3	Natural	1
LR69-1	R69	R70	301.6	0.014	829.53	829.05	Circular	6.5
LR69-2	R69	R70	301.6	0.015	845.3	852.3	Natural	1
LR69-3	R69	R142	645.13	0.015	845.3	841.3	Natural	1
LR70-1	R70	R72	18.1	0.014	829.05	823.7	Special	4.5
LR70-2	R70	R72	18.1	0.015	852.3	852.3	Natural	1
LR7-1	R7	R6	130.8	0.014	853.5	853	Circular	1.5
LR7-2	R7	R6	130.8	0.015	860.6	860.55	Natural	1
LR75-1	R72	DS1(39th)	212.72	0.014	823.7	823.5	Special	4.5
LR75-2	R72	DS1(39th)	187.4	0.015	852.3	837.6	Natural	1
LR78-1	R78	R81	21.6	0.014	832.55	832.55	Circular	1.25
LR78-2	R78	R81	21.6	0.015	839.74	839.74	Natural	1
LR8-1	R8	R7	152.6	0.014	857.98	855.9	Circular	1
LR81-1	R81	R83	12.4	0.014	832.55	832.55	Circular	0.833
LR81-2	R81	R83	12.4	0.015	839.74	839.74	Natural	1
LR8-2	R8	R7	152.6	0.015	860.8	860.6	Natural	1
LR82-1	R82	R86	76	0.014	827.03	826.83	Circular	4
LR82-2	R82	R86	76	0.015	834.55	836.3	Natural	1
LR83-1	R83	R89	8	0.014	832.62	826.3	Circular	0.833
LR83-2	R83	R89	8	0.015	839.74	839.3	Natural	1
LR86-1	R86	R89	170.5	0.014	824.87	824.3	Circular	8
LR86-2	R86	R89	170.5	0.015	836.3	839.3	Natural	1
LR89-1	R89	R90	4.7	0.014	823.65	823.65	Circular	2
LR89-2	R89	R90	4.7	0.015	839.3	839.61	Natural	1
LR90-1	R90	R53	234.7	0.014	831.6	846.4	Circular	1.333
LR90-2	R90	R53	234.7	0.015	839.61	850.3	Natural	1
LR9-1	R9	R12	54.5	0.014	852.88	851.84	Circular	1.5
LR9-2	R9	R12	54.5	0.015	860.3	859.74	Natural	1
LR93-1	R93	R60	167	0.014	835.8	833.69	Circular	0.75
LR93-2	R93	R60	167	0.015	839.6	845.7	Natural	1
LR94-1	R94	R77	258	0.014	829.79	829.63	Circular	6
LR94-2	R94	R77	258	0.015	838.8	844.3	Natural	1
LR95-1	R95	R143	185.3	0.014	838.3	837.87	Circular	0.75
LR95-2	R95	R143	185.3	0.015	842	845.8	Natural	1
LS100.1	V14521-2	MH136	74	0.014	871.16	868.2	Circular	1.25
LS100.2	V14521-2	MH136	74	0.015	876.09	875.05	Natural	1
LS101.1	V14521-1	MH136	46.5	0.014	868.47	868.2	Circular	1.25
LS101.2	V14521-1	MH136	46.5	0.015	875.64	875.05	Natural	1
LS102.1	MH136	MH140	156	0.014	868.8	868.64	Circular	3
LS102.2	MH136	MH140	156	0.015	875.86	875.43	Natural	1
LS103.1	MH140	MH143	98	0.014	868.64	868.54	Circular	3
LS103.2	MH140	MH143	98	0.015	875.43	875.17	Natural	1
LS104.1	MH143	V14500-1	83	0.014	868.54	868.46	Circular	3

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LS104.2	MH143	V14500-1	83	0.015	875.17	874.92	Natural	1
LS105.1	V14500.1	MH155A	234	0.014	867.99	867.64	Special	3
LS106.1	MH155A	MH156	42	0.014	867.64	867.58	Special	3
LS106.2	MH155A	MH156	42	0.015	874.3	874.16	Natural	1
LS107.1	MH156	V14356	57	0.014	867.58	867.49	Special	3
LS107.2	MH156	V14356	57	0.015	874.16	874.03	Natural	1
LS109.1	V14356-1	V14356	55	0.013	869.89	869.72	Circular	1.5
LS109.2	V14356-1	V14356	45	0.015	874.22	874.03	Natural	1
LS110.1	V14356	MH169	235	0.014	867.49	866.9	Special	3
LS110.2	V14356	MH169	235	0.015	874.03	873.34	Natural	1
LS111.1	MH169	V14497	64	0.014	866.9	866.74	Special	3
LS111.2	MH169	V14497	64	0.015	873.34	873.16	Natural	1
LS112.1	MH173	MH178	235	0.014	865.14	864.69	Circular	4.5
LS113.1	MH178	MH181	134	0.014	864.69	864.44	Circular	4.5
LS113.2	MH178	MH181	134	0.015	872.57	872.27	Natural	1
LS114.1	MH181	M14298	85	0.014	864.44	864.28	Circular	4.5
LS114.2	MH181	M14298	85	0.015	872.27	872.08	Natural	1
LS115.1	MH185	MH187	212	0.014	864.28	863.79	Circular	4.5
LS116.1	MH187	M14368-2	31	0.014	863.79	863.72	Circular	4.5
LS116.2	MH187	M14368-2	31	0.015	871.63	871.57	Natural	1
LS117.1	M14368-2	MH192	132	0.014	863.71	863.42	Circular	4.5
LS117.2	M14368-2	MH192	132	0.015	871.57	871.29	Natural	1
LS118.1	V14356-2	V14356	45	0.014	870.1	869.96	Special	1.5
LS118.2	V14356-2	V14356	45	0.015	874.23	874.03	Natural	1
LS119.1	MH192	GC3	12	0.014	863.42	863.39	Circular	4.5
LS119.2	MH192	GC3	12	0.015	871.29	871.26	Natural	1
LS120.1	GC3	MH195	55	0.014	863.39	863.25	Circular	4.5
LS120.2	GC3	MH195	55	0.015	871.26	871.04	Natural	1
LS121.1	MH195	M14368-1	18	0.014	863.25	862.77	Circular	2
LS121.2	MH195	M14368-1	18	0.015	871.04	870.97	Natural	1
LT19194-1	T19194	T19249	221.5	0.014	870.99	870.51	Circular	1.5
LT19194-2	T19194	T19249	221.5	0.015	875.3	875.05	Natural	1
LT19194-3	T19194	V19138	385.09	0.015	875.3	871.1	Natural	1
LT19249-1	T19249	T19298	242.9	0.014	870.51	870.47	Circular	1.5
LT19249-2	T19249	T19298	242.9	0.015	875.05	874.8	Natural	1
LT19290-1	T19290	T19295	115.1	0.014	861.05	858.83	Circular	0.75
LT19290-2	T19290	T19295	115.1	0.015	868.05	865.9	Natural	1
LT19291-1	T19291	T19290	123	0.014	862.3	861.05	Circular	0.75
LT19291-2	T19291	T19290	123	0.015	866.3	868.05	Natural	1
LT19295-1	T19295	T19437	120.9	0.014	858.83	858.21	Circular	1
LT19295-2	T19295	T19437	120.9	0.015	865.9	865.52	Natural	1
LT19298-1	T19298	T19718	163.5	0.014	870.47	870.42	Circular	1.5
LT19298-2	T19298	T19718	163.5	0.015	874.8	874.55	Natural	1
LT19316-1	T19316	T19713	170	0.014	870.67	869.82	Circular	1.25

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LT19316-2	T19316	T19713	170	0.015	875.8	875.05	Natural	1
LT19437-1	T19437	T19491	24.2	0.014	858.21	857.51	Circular	1
LT19437-2	T19437	T19491	24.2	0.015	865.52	865.3	Natural	1
LT19491-1	T19491	T19811	68	0.014	857.51	857.3	Circular	1.75
LT19491-2	T19491	T19811	68	0.015	865.3	865.3	Natural	1
LT19495-1	T19495	T19491	139.2	0.014	857.87	857.51	Circular	1.5
LT19495-2	T19495	T19491	139.2	0.015	865.8	865.3	Natural	1
LT19507-1	T19507	T19510	23.8	0.014	858.87	858.3	Circular	1.5
LT19507-2	T19507	T19510	23.8	0.015	866.1	866.3	Natural	1
LT19510-1	T19510	T19495	166.6	0.014	858.3	857.87	Circular	1.5
LT19510-2	T19510	T19495	166.6	0.015	866.3	865.8	Natural	1
LT19511-1	T19511	T19507	140.3	0.014	859.29	858.87	Circular	1.5
LT19511-2	T19511	T19507	140.3	0.015	865.8	866.1	Natural	1
LT19513-1	T19513	T19511	150.4	0.014	859.75	859.29	Circular	1.5
LT19513-2	T19513	T19511	150.4	0.015	865.3	865.8	Natural	1
LT19513-3	T19513	T20349	673.71	0.015	865.3	850.1	Natural	1
LT19638-1	T19638	T19825	38.8	0.014	853.3	853.06	Circular	3.5
LT19638-2	T19638	T19825	38.8	0.015	860.68	860.14	Natural	1
LT19641-1	T19641	T19638	394.3	0.014	855.19	853.9	Circular	3.5
LT19641-2	T19641	T19638	394.3	0.015	869.1	860.68	Natural	1
LT19643-1	T19643	T19641	53.6	0.014	855.43	855.19	Circular	3.5
LT19643-2	T19643	T19641	53.6	0.015	869.2	869.1	Natural	1
LT19643-3	T19643	T20452	655.08	0.015	869.1	865.8	Natural	1
LT19666-1	T19666	T19643	227	0.014	857.08	855.43	Circular	3.5
LT19666-2	T19666	T19643	227	0.015	870.1	869.1	Natural	1
LT19672-1	T19672	T19666	149.9	0.014	858.49	857.67	Circular	3.5
LT19672-2	T19672	T19666	149.9	0.015	870.29	870.1	Natural	1
LT19678-1	T19678	T19672	37.7	0.014	858.6	858.49	Circular	3.5
LT19678-2	T19678	T19672	37.7	0.015	870.3	870.29	Natural	1
LT19695-1	T19695	T19678	297.9	0.014	862.5	861	Circular	3.5
LT19695-2	T19695	T19678	297.9	0.015	871.3	870.3	Natural	1
LT19696-1	T19696	T19695	40.2	0.014	862.69	862.5	Circular	3.5
LT19696-2	T19696	T19695	40.2	0.015	871.4	871.3	Natural	1
LT19701-1	T19701	T19696	296	0.014	863.6	862.71	Circular	3.5
LT19701-2	T19701	T19696	296	0.015	872.3	871.3	Natural	1
LT19703-1	T19703	T19701	31.9	0.014	863.7	863.6	Circular	3.5
LT19703-2	T19703	T19701	31.9	0.015	872.4	872.3	Natural	1
LT19704-1	T19704	T19703	310.6	0.014	864.36	863.74	Circular	3.5
LT19704-2	T19704	T19703	310.6	0.015	873.3	872.3	Natural	1
LT19705-1	T19705	T19704	29.9	0.014	864.48	864.36	Circular	3.5
LT19705-2	T19705	T19704	29.9	0.015	873.3	873.3	Natural	1
LT19708-1	T19708	T19705	282.2	0.014	865.23	864.48	Circular	3
LT19708-2	T19708	T19705	282.2	0.015	873.8	873.3	Natural	1
LT19709-1	T19709	T19713	166.3	0.014	869.64	869.32	Circular	1.75

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LT19709-2	T19709	T19713	166.3	0.015	875.3	875.05	Natural	1
LT19710-1	T19710	T19708	59.7	0.014	866.7	865.33	Circular	2.5
LT19710-2	T19710	T19708	59.7	0.015	873.8	873.8	Natural	1
LT19712-1	T19712	T19710	24	0.014	867.8	866.7	Circular	2.5
LT19712-2	T19712	T19710	24	0.015	873.8	873.8	Natural	1
LT19713-1	T19713	T19716	125.3	0.014	869.32	869.08	Circular	1.75
LT19713-2	T19713	T19716	125.3	0.015	875.05	874.8	Natural	1
LT19714-1	T19714	T19709	45.1	0.014	869.85	869.64	Circular	1.75
LT19714-2	T19714	T19709	45.1	0.015	875.3	875.3	Natural	1
LT19715-1	T19715	T19712	124.1	0.014	868.51	867.8	Circular	2.5
LT19715-2	T19715	T19712	124.1	0.015	874.3	873.8	Natural	1
LT19716-1	T19716	T19717	27.7	0.014	869.08	869.07	Circular	2.5
LT19716-2	T19716	T19717	27.7	0.015	874.8	874.8	Natural	1
LT19717-1	T19717	T19715	140.9	0.014	869.07	868.51	Circular	2.5
LT19717-2	T19717	T19715	140.9	0.015	874.8	874.3	Natural	1
LT19718-1	T19718	T19714	286.2	0.014	870.42	869.85	Circular	1.75
LT19718-2	T19718	T19714	286.2	0.015	874.55	875.3	Natural	1
LT19718-3	T19718	V19728	403.02	0.015	874.55	865.5	Natural	1
LT19825-1	T19825	T19855	21.5	0.014	853.06	852.72	Special	1.67
LT19825-2	T19825	T19855	21.5	0.015	860.14	859.55	Natural	1
LT19855-1	T19855	T19918	304.7	0.014	852.72	849.32	Circular	3.5
LT19855-2	T19855	T19918	304.7	0.015	859.55	855.45	Natural	1
LT19868-1	T19811	T19885	202.3	0.014	857.3	856.66	Circular	1.75
LT19868-2	T19811	T19885	202.3	0.015	865.3	866.05	Natural	1
LT19878-1	T19878	T19909	144	0.014	858.55	857.84	Circular	0.75
LT19878-2	T19878	T19909	144	0.015	862.25	862.55	Natural	1
LT19878-3	T19878	T19918	264.8	0.015	862.25	855.45	Natural	1
LT19885-1	T19885	T19940	212.5	0.014	856.655	855.98	Circular	1.75
LT19885-2	T19885	T19940	212.5	0.015	866.05	865.05	Natural	1
LT19909-1	T19909	T19950	162	0.014	857.84	857.05	Circular	0.75
LT19909-2	T19909	T19950	162	0.015	862.55	863.05	Natural	1
LT19918-1	T19918	T20470	301.5	0.014	849.09	846.87	Circular	4
LT19918-2	T19918	T20470	301.5	0.015	855.45	857.3	Natural	1
LT19940-1	T19940	T20163	186.6	0.014	855.978	855.42	Circular	1.75
LT19940-2	T19940	T20163	186.6	0.015	865.05	863.3	Natural	1
LT19946-1	T19946	T20465	182.5	0.014	866.27	865.5	Circular	1
LT19946-2	T19946	T20465	182.5	0.015	869.72	870.9	Natural	1
LT19950-1	T19950	T20429	149	0.014	857.05	856.3	Circular	0.75
LT19950-2	T19950	T20429	149	0.015	863.05	861.55	Natural	1
LT20163-1	T20163	T20468	26.3	0.014	855.42	854.3	Circular	1.75
LT20163-2	T20163	T20468	26.3	0.015	863.3	863.3	Natural	1
LT20349-1	T20349	T20358	72.4	0.014	839.79	839.73	Circular	6.5
LT20349-2	T20349	T20358	72.4	0.015	850.1	850	Natural	1
LT20349-3	T20358	U20747	302.4	0.015	850	845.02	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LT20353-1	T20353	T20476	122.9	0.014	839.69	839.37	Circular	6.5
LT20353-2	T20353	T20476	122.9	0.015	850.2	851.5	Natural	1
LT20357-1	T20357	T20349	20.4	0.014	839.92	839.79	Circular	6
LT20357-2	T20357	T20349	20.4	0.015	850.05	850	Natural	1
LT20358-1	T20358	T20353	17	0.014	839.73	839.69	Circular	6.5
LT20358-2	T20358	T20353	17	0.015	850	850.2	Natural	1
LT20375-1	T20375	T20477	34.1	0.014	849	848.65	Circular	3
LT20375-2	T20375	T20477	34.1	0.015	857.55	857.3	Natural	1
LT20405-1	T20405	T20357	173.2	0.014	841.06	839.92	Circular	6
LT20405-2	T20405	T20357	173.2	0.015	853.05	850.05	Natural	1
LT20429-1	T20429	T20375	160.3	0.014	852.09	849	Circular	3
LT20429-2	T20429	T20375	160.3	0.015	861.55	857.55	Natural	1
LT20452-1	T20452	T20454	39.3	0.014	859.32	857.87	Special	2.219
LT20452-2	T20452	T20454	39.3	0.015	865.8	865.62	Natural	1
LT20454-1	T20454	T20429	212.2	0.014	857.87	853.6	Circular	3
LT20454-2	T20454	T20429	212.2	0.015	865.62	861.55	Natural	1
LT20459-1	T20459	T20405	243.8	0.014	845	842.63	Circular	6
LT20459-2	T20459	T20405	243.8	0.015	856.55	853.05	Natural	1
LT20461-1	T20461	T20452	395.8	0.014	863.64	859.8	Circular	3
LT20461-2	T20461	T20452	395.8	0.015	870.05	865.8	Natural	1
LT20463-1	T20463	T20461	32.5	0.014	863.77	863.64	Circular	3
LT20463-2	T20463	T20461	32.5	0.015	870.55	870.05	Natural	1
LT20465-1	T20465	T20466	7.7	0.014	864.73	864.66	Circular	3
LT20465-2	T20465	T20466	7.7	0.015	871.05	870.9	Natural	1
LT20466-1	T20466	T20463	147.9	0.014	864.66	863.77	Circular	3
LT20466-2	T20466	T20463	147.9	0.015	870.9	870.55	Natural	1
LT20467-1	T20473	T20468	318	0.014	838.89	838.12	Circular	6.5
LT20467-2	T20473	T20468	318	0.015	853.6	863.3	Natural	1
LT20468-1	T20468	DS1(39th)	147.36	0.014	827.34	826.8	Circular	7
LT20468-2	T20468	DS1(39th)	147.36	0.015	863.3	837.6	Natural	1
LT20470-1	T20470	T20459	35.9	0.014	845.14	845	Circular	6
LT20470-2	T20470	T20459	35.9	0.015	857.3	856.55	Natural	1
LT20476-1	T20476	T20473	182	0.014	839.37	838.89	Circular	6.5
LT20476-2	T20476	T20473	182	0.015	851.5	853.6	Natural	1
LT20477-1	T20477	T20470	21.7	0.014	846.14	846.1	Circular	5.5
LT20477-2	T20477	T20470	21.7	0.015	857.3	857.3	Natural	1
LT20481-1	T20481	T20483	44.8	0.014	865.24	864.92	Circular	3
LT20481-2	T20481	T20483	44.8	0.015	871.3	871.05	Natural	1
LT20483-1	T20483	T20465	134.7	0.014	864.92	864.73	Circular	3
LT20483-2	T20483	T20465	134.7	0.015	871.05	870.9	Natural	1
LT20498-1	T20498	T20481	301	0.014	866.38	865.24	Circular	3
LT20498-2	T20498	T20481	301	0.015	873	871.3	Natural	1
LT20499-1	T20499	T20498	21.5	0.014	866.52	866.38	Circular	3
LT20499-2	T20499	T20498	21.5	0.015	873.1	873	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LT20507-1	T20507	T20520	290.3	0.014	869.03	868.14	Circular	2.25
LT20507-2	T20507	T20520	290.3	0.015	874.8	873.3	Natural	1
LT20511-1	T20511	T20507	61.9	0.014	869.3	869.03	Circular	2.25
LT20511-2	T20511	T20507	61.9	0.015	874.8	874.8	Natural	1
LT20520-1	T20520	T20530	27.6	0.014	867.82	868.02	Circular	2.5
LT20520-2	T20520	T20530	27.6	0.015	873.4	873.3	Natural	1
LT20524-1	T20524	T20511	280.1	0.014	870.23	869.51	Circular	2
LT20524-2	T20524	T20511	280.1	0.015	875.8	874.8	Natural	1
LT20530-1	T20530	T20499	314.9	0.014	868.02	866.88	Circular	2.5
LT20530-2	T20530	T20499	314.9	0.015	873.3	873.1	Natural	1
LT20531-1	T20531	T20524	35.8	0.014	870.57	870.23	Circular	2
LT20531-2	T20531	T20524	35.8	0.015	875.8	875.8	Natural	1
LT20531-3	T20531	T19716	656.03	0.015	875.8	874.8	Natural	1
LT20551-1	T20551	T20531	284.1	0.014	871.45	870.57	Circular	2
LT20551-2	T20551	T20531	284.1	0.015	877.05	875.8	Natural	1
LT20568-1	T20568	T20405	24	0.014	843.13	842.13	Circular	1
LT20568-2	T20568	T20405	24	0.015	852.43	853.05	Natural	1
LT20621-1	T20621	T20466	24.5	0.014	864.8	864.66	Circular	1
LT20621-2	T20621	T20466	24.5	0.015	870.8	870.9	Natural	1
LT20640-1	T20640	T20454	37	0.014	858.19	857.87	Circular	1
LT20640-2	T20640	T20454	37	0.015	865.74	865.62	Natural	1
LT20706-1	T20706	T20640	100.1	0.014	858.71	858.19	Circular	1
LT20706-2	T20706	T20640	100.1	0.015	865.11	865.74	Natural	1
LT20706-3	T20706	T21176	516.14	0.015	865.11	862.05	Natural	1
LT20713-1	T20713	T20706	36.6	0.014	858.8	858.71	Circular	0.75
LT20713-2	T20713	T20706	36.6	0.015	865.3	865.11	Natural	1
LT20714-1	T20714	T20713	181.5	0.014	860.3	858.8	Circular	0.75
LT20714-2	T20714	T20713	181.5	0.015	865.3	865.3	Natural	1
LT20738-1	T20738	T20568	206.7	0.014	844.23	843.13	Circular	1
LT20738-2	T20738	T20568	206.7	0.015	848.23	852.43	Natural	1
LT20751-1	T20751	T20477	305	0.014	847	846.11	Circular	5.5
LT20751-2	T20751	T20477	305	0.015	856.3	857.3	Natural	1
LT20761-1	T20761	T20621	315	0.014	865.8	865	Circular	1
LT20761-2	T20761	T20621	315	0.015	868.3	870.8	Natural	1
LT20831-1	T20831	T21293	93	0.014	870.5	869.08	Circular	0.75
LT20831-2	T20831	T21293	93	0.015	874	875.48	Natural	1
LT21001-1	T21001	T20751	319	0.014	847.9	847	Circular	5.5
LT21001-2	T21001	T20751	319	0.015	855.3	856.3	Natural	1
LT21152-1	T21152	T21168	140	0.014	849.31	848.49	Circular	4
LT21152-2	T21152	T21168	140	0.015	858.3	855.8	Natural	1
LT21168-1	T21168	T21001	28.7	0.014	848.49	847.9	Circular	4
LT21168-2	T21168	T21001	28.7	0.015	855.8	855.3	Natural	1
LT21168-3	T21001	U21230	246.94	0.015	855.3	849	Natural	1
LT21175-1	T21175	T21176	36.7	0.014	854.52	853.76	Special	4.26

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LT21175-2	T21175	T21176	36.7	0.015	862.3	862.05	Natural	1
LT21176-1	T21176	T21152	245.4	0.014	853.76	850.53	Circular	3.5
LT21176-2	T21176	T21152	245.4	0.015	862.05	858.3	Natural	1
LT21199-1	T21199	T21175	90.9	0.014	856.42	854.52	Circular	3.5
LT21199-2	T21199	T21175	90.9	0.015	865.3	862.3	Natural	1
LT21206-1	T21206	T21199	294.2	0.014	861.23	856.42	Circular	3.5
LT21206-2	T21206	T21199	294.2	0.015	871.9	865.3	Natural	1
LT21261-1	T21261	T21206	14.7	0.014	862.27	861.78	Circular	3.5
LT21261-2	T21261	T21206	14.7	0.015	872	871.9	Natural	1
LT21262-1	T21262	T21261	35.6	0.014	865.8	865.09	Circular	3
LT21262-2	T21262	T21261	35.6	0.015	872.07	871.9	Natural	1
LT21280-1	T21280	T21262	298.1	0.014	867.21	866.1	Circular	3
LT21280-2	T21280	T21262	298.1	0.015	873.83	872.07	Natural	1
LT21281-1	T21281	T21280	43.4	0.014	867.4	867.21	Circular	3
LT21281-2	T21281	T21280	43.4	0.015	872.9	873.83	Natural	1
LT21283-3	T21281	T20483	669.87	0.015	872.9	870.55	Natural	1
LT21290-1	T21290	T21291	34.7	0.014	868.37	868.4	Circular	2.75
LT21290-2	T21290	T21291	34.7	0.015	874.8	874.72	Natural	1
LT21291-1	T21291	T21281	299.8	0.014	868.4	867.4	Circular	2.75
LT21291-2	T21291	T21281	299.8	0.015	874.72	872.9	Natural	1
LT21293-1	T21293	T21290	147	0.014	868.93	868.37	Circular	2.5
LT21293-2	T21293	T21290	147	0.015	875.48	874.8	Natural	1
LT21296-1	T21296	T21300	247.8	0.014	886.02	879.5	Circular	1
LT21296-2	T21296	T21300	247.8	0.015	893.3	884.3	Natural	1
LT21298-1	T21298	T21299	36	0.014	879.01	878.71	Circular	1.5
LT21298-2	T21298	T21299	36	0.015	883.55	883.3	Natural	1
LT21299-1	T21299	T21311	145.9	0.014	878.37	877.35	Circular	1.5
LT21299-2	T21299	T21311	145.9	0.015	883.3	883	Natural	1
LT21299-3	T21299	T20531	666.77	0.015	883.3	875.8	Natural	1
LT21300-1	T21300	T21298	41.8	0.014	879.5	879.01	Circular	1
LT21300-2	T21300	T21298	41.8	0.015	884.3	883.55	Natural	1
LT21305-1	T21305	T21293	147.6	0.014	869.46	868.93	Circular	2.5
LT21305-2	T21305	T21293	147.6	0.015	876.26	875.48	Natural	1
LT21308-1	T21308	T21305	27	0.014	869.53	869.46	Circular	2.5
LT21308-2	T21308	T21305	27	0.015	876.53	876.26	Natural	1
LT21311-1	T21311	T21322	124	0.014	877.35	876.92	Circular	1.5
LT21311-2	T21311	T21322	124	0.015	883	882.8	Natural	1
LT21320-1	T21320	T21308	322.4	0.014	874.46	870.63	Circular	1.75
LT21320-2	T21320	T21308	322.4	0.015	883.24	876.53	Natural	1
LT21320-3	T21320	T20511	673.86	0.015	883.24	874.8	Natural	1
LT21322-1	T21322	T21320	48.1	0.014	876.88	876.53	Circular	1.5
LT21322-2	T21322	T21320	48.1	0.015	882.8	883.24	Natural	1
LT21359-1	T21359	T21261	36.1	0.014	863.46	862.27	Circular	3.5
LT21359-2	T21359	T21261	36.1	0.015	871.8	871.9	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LT21439-1	T21439	T21359	348.6	0.014	867.97	864.6	Circular	3.5
LT21439-2	T21439	T21359	348.6	0.015	877.3	871.8	Natural	1
LT21890-1	T21890	T21439	258.1	0.014	868.58	867.97	Circular	3.5
LT21890-2	T21890	T21439	258.1	0.015	878.3	877.3	Natural	1
LT22070-1	T22070	T22072	55.5	0.014	871.6	871.46	Circular	2.5
LT22070-2	T22070	T22072	55.5	0.015	877.3	877.3	Natural	1
LT22072-1	T22072	T21890	304	0.014	871.46	870.53	Circular	2.5
LT22072-2	T22072	T21890	304	0.015	877.3	878.3	Natural	1
LT22077-1	T22077	T22070	333	0.014	878.18	871.6	Circular	1.5
LT22077-2	T22077	T22070	333	0.015	884.3	877.3	Natural	1
LT22077-3	T22077	42_HA	655.01	0.015	884.3	880.1	Natural	1
LT22082-1	T22082	T22077	322.3	0.014	880.9	878.18	Circular	1.5
LT22082-2	T22082	T22077	322.3	0.015	887.3	884.3	Natural	1
LT22082-3	T22082	T21305	666.47	0.015	887.3	876.26	Natural	1
LT22083-1	T22083	T22082	305.9	0.014	884.24	881.55	Circular	1
LT22083-2	T22083	T22082	305.9	0.015	890.3	887.3	Natural	1
LT22083-3	T22083	T21320	666.24	0.015	890.3	883.24	Natural	1
LT22087-1	T22087	T22083	53.9	0.014	884.35	884.24	Circular	1
LT22087-2	T22087	T22083	53.9	0.015	890.3	890.3	Natural	1
LT22090-1	T22090	T22087	320.8	0.014	886.25	884.35	Circular	1
LT22090-2	T22090	T22087	320.8	0.015	891.3	890.3	Natural	1
LT22090-3	T22090	T21299	674.13	0.015	891.3	883.3	Natural	1
LT22096-1	T22096	T21890	41.4	0.014	868.71	868.58	Circular	3.5
LT22096-2	T22096	T21890	41.4	0.015	878.3	878.3	Natural	1
LT22233	T22233	T22846	180	0.014	878.8	877.8	Circular	0.75
LT22263	T22263	T22820.1	108.7	0.013	871.3	870.49	Circular	1
LT22683-1	T22683	T22096	622.6	0.014	869.84	868.71	Circular	3.5
LT22683-2	T22683	T22096	622.6	0.015	879.3	878.3	Natural	1
LT22803-1	T22803	T22683	180	0.014	870.09	869.84	Circular	3.5
LT22803-2	T22803	T22683	180	0.015	878.8	879.3	Natural	1
LT22808-1	T22808	T22803	118.9	0.014	870.29	870.09	Circular	3.5
LT22808-2	T22808	T22803	118.9	0.015	878.3	878.8	Natural	1
LT22811-1	T22812	T22808	78.3	0.014	870.37	870.29	Circular	3
LT22811-2	T22812	T22808	78.3	0.015	878.3	878.3	Natural	1
LT22812-3	T22812	T22072	658.25	0.015	878.3	877.3	Natural	1
LT22820-1	T22820	T22820.1	162.5	0.014	870.67	870.49	Circular	3.5
LT22820-1.	T22820.1	T22812	106.4	0.014	870.49	870.37	Circular	3.5
LT22820-2	T22820	T22820.1	162.5	0.016	879.3	878.7	Natural	1
LT22820-2.	T22820.1	T22812	106.4	0.016	878.7	878.3	Natural	1
LT22824-1	T22824	T22820	43.9	0.014	873.34	873.04	Circular	1
LT22824-2	T22824	T22820	43.9	0.015	880.1	879.3	Natural	1
LT22846-1	T22846	T22824	136.1	0.014	877.8	873.3	Circular	0.75
LT22846-2	T22846	T22824	136.1	0.015	885.8	880.1	Natural	1
LT22892-1	T22892	T22820	34.9	0.014	871.02	870.7	Circular	3

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LT22892-2	T22892	T22820	34.9	0.015	879.3	879.3	Natural	1
LT22929-1	T22929	T22803	144.5	0.014	871.27	870.36	Circular	0.75
LT22929-2	T22929	T22803	144.5	0.015	875.4	878.8	Natural	1
LT22962-1	T22962	T22929	165	0.014	872.3	871.27	Circular	0.75
LT22962-2	T22962	T22929	165	0.015	875.3	875.4	Natural	1
LT23434-1	T23434	T22892	608	0.014	871.8	871.02	Circular	3
LT23434-2	T23434	T22892	608	0.015	879.3	879.3	Natural	1
LT23544-1	T23544	T23434	152.2	0.014	872.02	871.8	Circular	1.5
LT23544-2	T23544	T23434	152.2	0.015	878.3	879.3	Natural	1
LT23563-1	T23563	T23565	40.6	0.014	872.61	872.22	Circular	1
LT23563-2	T23563	T23565	40.6	0.015	877.3	877.3	Natural	1
LT23563-3	T23563	U23539	337.04	0.015	877.3	870.3	Natural	1
LT23565-1	T23565	N510	129	0.014	872.22	872	Circular	1.5
LT23565-2	T23565	N510	129	0.016	877.3	878.3	Natural	1
LT23647-1	T23647	T23434	72	0.014	874.24	872.51	Circular	2
LT23647-2	T23647	T23434	72	0.015	879.3	879.3	Natural	1
LT23752-1	T23752	T23647	280.5	0.014	874.81	874.24	Circular	1.75
LT23752-2	T23752	T23647	280.5	0.015	881.3	879.3	Natural	1
LT24284-1	T24284	T24297	116.2	0.014	877.5	876.57	Circular	1
LT24284-2	T24284	T24297	116.2	0.015	882.3	881.3	Natural	1
LT24287-1	T24287	T24284	170.3	0.014	877.54	877.5	Circular	1
LT24287-2	T24287	T24284	170.3	0.015	883.05	882.3	Natural	1
LT24297-1	T24297	T24331	73.2	0.014	876.57	876.16	Circular	1
LT24297-2	T24297	T24331	73.2	0.015	881.3	881.3	Natural	1
LT24297-3	T24297	T23563	662.59	0.015	881.3	877.3	Natural	1
LT24301-1	T24301	T24261	25.9	0.014	159.79	159.75	Circular	1
LT24301-2	T24301	T24261	10	0.015	0.05	0	Natural	1
LT24319-1	T24319	T24287	23	0.014	878.13	877.54	Circular	0.67
LT24319-2	T24319	T24287	23	0.015	883.3	883.05	Natural	1
LT24331-1	T24331	T24339	267.9	0.014	876.16	875.7	Circular	1.75
LT24331-2	T24331	T24339	267.9	0.015	881.3	886.3	Natural	1
LT24339-1	T24339	T23752	346.9	0.014	875.7	874.81	Circular	1.75
LT24339-2	T24339	T23752	346.9	0.015	886.3	881.3	Natural	1
LT99991	T99991	T99992	367	0.014	843.62	842.52	Circular	1.5
LT99992	T99992	T20405	488	0.014	842.52	841.06	Circular	2
LU1471	U23501	U99998	15.03	0.014	857.54	857.5	Circular	1.75
LU1471-3	U23501	U99998	15.03	0.015	864.5	864.3	Natural	1
LU1474	U23597	U99998	28	0.014	860.3	860.2	Circular	1.5
LU1573	U99997	U23501	10	0.014	857.3	857.8	Circular	1
LU20747-1	U20747	U20790	201.8	0.014	840.5	839.54	Circular	1
LU20747-2	U20747	U20790	201.8	0.015	845.02	844.2	Natural	1
LU20790-1	U20790	U20984	133.1	0.014	836.54	835.85	Circular	1.25
LU20790-2	U20790	U20984	133.1	0.015	844.2	843.77	Natural	1
LU20795-1	U20795	U21117	107	0.014	834.8	834.3	Circular	0.75

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU20795-2	U20795	U21117	107	0.015	840.5	841.44	Natural	0.8
LU20984-1	U20984	U21122	28.3	0.014	835.85	835.5	Circular	1.25
LU20984-2	U20984	U21122	28.3	0.015	843.77	843.5	Natural	1
LU21092-1	U21092	40TH	150.48	0.014	825.53	824.3	Circular	3
LU21092-2	U21092	40TH	150.48	0.015	847.8	832.2	Natural	1
LU21117-1	U21117	U21149	166.1	0.014	833.62	832.81	Circular	2.5
LU21117-2	U21117	U21149	166.1	0.015	841.3	839.32	Natural	1
LU21122-1	U21122	U21117	140.8	0.014	834.42	833.69	Circular	2.5
LU21122-2	U21122	U21117	140.8	0.015	843.4	841.3	Natural	1
LU21136-1	U21136	U21145	280.7	0.014	832.08	830.2	Circular	3
LU21136-2	U21136	U21145	280.7	0.015	839.8	846.8	Natural	1
LU21145-1	U21145	U21092	46.8	0.014	830.2	829.78	Circular	3
LU21145-2	U21145	U21092	46.8	0.015	846.8	847.8	Natural	1
LU21149-1	U21149	U21136	26.3	0.014	832.26	832.08	Circular	3
LU21149-2	U21149	U21136	26.3	0.015	839.32	839.8	Natural	1
LU21149-4	U21149	U22569	1348.1	0.015	839.32	838.78	Natural	1
LU21211-1	U21211	U21122	25.3	0.014	834.64	834.5	Special	1.5
LU21211-2	U21211	U21122	25.3	0.015	843.5	843.4	Natural	1
LU21226-1	U21226	U21211	37.8	0.014	838.08	837.73	Circular	1.5
LU21226-2	U21226	U21211	37.8	0.015	843.6	843.5	Natural	1
LU21230-1	U21230	U21226	218.1	0.014	841.5	839.32	Circular	1.5
LU21230-2	U21230	U21226	218.1	0.015	849	843.6	Natural	1
LU21428-1	U21428	U21211	356.9	0.014	840.34	838.25	Circular	1.5
LU21428-2	U21428	U21211	356.9	0.015	847.36	843.7	Natural	1
LU21729-1	U21729	U21428	276.6	0.014	841.54	840.34	Circular	1.5
LU21729-2	U21729	U21428	276.6	0.015	849.5	847.36	Natural	1
LU21809-1	U21809	U22187	335.4	0.014	840.41	839.07	Circular	1.5
LU21809-2	U21809	U22187	335.4	0.015	849	845.92	Natural	1
LU21866-1	U21866	U21809	156	0.014	841.3	840.59	Circular	0.75
LU21866-2	U21866	U21809	156	0.015	850.45	849	Natural	1
LU21949-1	U21949	U21729	59.2	0.014	843.26	843	Circular	1.5
LU21949-2	U21949	U21729	59.2	0.015	850.16	849.5	Natural	1
LU21973-1	U21973	U21949	300.3	0.014	862.45	845.8	Circular	1
LU21973-2	U21973	U21949	300.3	0.015	869.3	850.16	Natural	1
LU21973-3	U21973	U21230	663.43	0.015	869.3	849	Natural	1
LU22005-1	U22005	U21973	349.3	0.014	878.16	862.45	Circular	1
LU22005-2	U22005	U21973	349.3	0.015	882.3	869.3	Natural	1
LU22005-3	U22005	U22749	659.73	0.015	882.3	876.3	Natural	1
LU22150-1	U22150	U21866	144.7	0.014	843	841.3	Circular	0.75
LU22150-2	U22150	U21866	144.7	0.015	851.15	850.45	Natural	1
LU22187-1	U22187	U22413	298	0.014	839.07	838	Circular	1.5
LU22187-2	U22187	U22413	298	0.015	845.92	843.8	Natural	1
LU22192-1	U22192	U22150	197	0.014	843.8	843	Circular	0.75
LU22192-2	U22192	U22150	197	0.015	847.8	851.15	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU22413-1	U22413	42ND	146.33	0.014	838	814.3	Circular	3
LU22413-2	U22413	42ND	146.33	0.015	843.8	821.5	Natural	1
LU22439-1	U22485	42ND	151.58	0.014	832.1	814.3	Circular	1.75
LU22439-2	U22485	42ND	151.58	0.015	839.05	821.5	Natural	1
LU22511-1	U22511	U22413	36.7	0.014	838.3	838.1	Circular	2
LU22511-2	U22511	U22413	36.7	0.015	844.3	843.8	Natural	1
LU22515-1	U22515	U22530	159.5	0.014	844.3	841.18	Circular	1.25
LU22515-2	U22515	U22530	159.5	0.015	850.3	847.3	Natural	1
LU22530-1	U22530	U22511	147.5	0.014	841.18	838.3	Circular	1.25
LU22530-2	U22530	U22511	147.5	0.015	847.3	844.3	Natural	1
LU22569-1	U22569	U22485	61.2	0.014	832.56	832.3	Circular	1.25
LU22569-2	U22569	U22485	61.2	0.015	838.78	838.57	Natural	1
LU22577-1	U22577	U22569	148.7	0.014	833.42	832.56	Circular	1.25
LU22577-2	U22577	U22569	148.7	0.015	839.3	838.78	Natural	1
LU22580-1	U22580	U22587	184.2	0.014	844.92	835.67	Circular	1
LU22580-2	U22580	U22587	184.2	0.015	853.2	840.3	Natural	1
LU22587-1	U22587	U22577	150.8	0.014	834.3	833.42	Circular	1.25
LU22587-2	U22587	U22577	150.8	0.015	840.3	839.3	Natural	1
LU22606-1	U22606	U22580	181.5	0.014	857	848	Circular	1
LU22606-2	U22606	U22580	181.5	0.015	864.3	853.2	Natural	1
LU22606-3	U22606	U23453	667.43	0.015	864.3	859.3	Natural	1
LU22634-1	U22634	U22941	231.5	0.014	866.8	863.51	Circular	1.25
LU22634-2	U22634	U22941	231.5	0.015	873.8	870.3	Natural	1
LU22749-1	U22749	U22634	317	0.014	871.16	869.05	Circular	1
LU22749-2	U22749	U22634	317	0.015	876.3	873.8	Natural	1
LU22749-3	U22749	U23502	657.68	0.015	876.3	864.3	Natural	1
LU22817-1	U22817	U22936	183.9	0.014	867.3	860.8	Circular	1.25
LU22817-2	U22817	U22936	183.9	0.015	873.8	866.3	Natural	1
LU22936-1	U22936	U22980	212.5	0.014	860.8	860.44	Circular	1.25
LU22936-2	U22936	U22980	212.5	0.015	866.3	865.8	Natural	1
LU22941-1	U22941	U22986	220.3	0.014	863.51	860.38	Circular	1.25
LU22941-2	U22941	U22986	220.3	0.015	870.3	866.3	Natural	1
LU22942-1	U22942	U22990	256	0.014	865.3	863.8	Circular	0.75
LU22942-2	U22942	U22990	256	0.015	869.6	868.9	Natural	1
LU22980-1	U22980	U23526	255.7	0.014	860.44	860	Circular	1.25
LU22980-2	U22980	U23526	255.7	0.015	865.8	865.3	Natural	1
LU22986-1	U22986	U23480	212.6	0.014	860.38	857.3	Circular	1.25
LU22986-2	U22986	U23480	212.6	0.015	866.3	863.3	Natural	1
LU22990-1	U22990	U23468	186	0.014	863.8	856.3	Circular	0.75
LU22990-2	U22990	U23468	186	0.015	868.9	861.3	Natural	1
LU22992-1	U22992	U23533	177	0.014	861.68	861.24	Circular	1.25
LU22992-2	U22992	U23533	172	0.016	864.05	868.3	Natural	0.5
LU23200	U23200	43RD_ORIF	64	0.014	814.66	814.13	Circular	4
LU23424-1	U23424	U23200	31.8	0.014	830.04	829.39	Circular	2

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU23424-2	U23424	U23200	31.8	0.015	840.3	838.3	Natural	1
LU23429-1	U23429	U23424	32.3	0.014	834.3	833.77	Circular	2
LU23429-2	U23429	U23424	32.3	0.015	840.3	840.3	Natural	1
LU23436-1	U23436	U23429	156.8	0.014	837.3	834.3	Circular	2
LU23436-2	U23436	U23429	156.8	0.015	844.8	840.3	Natural	1
LU23442-1	U23442-1	U23436	178	0.014	840.3	837.3	Circular	2
LU23442-2	U23442-1	U23436	178	0.015	849.3	844.8	Natural	1
LU23442-3	U23442-1	U22587	665.92	0.015	849.3	840.3	Natural	1
LU23445-1	U23445	U23442-1	142.9	0.014	847.3	840.3	Circular	2
LU23445-2	U23445	U23442-1	142.9	0.015	854.3	849.3	Natural	1
LU23449-1	U23449	U23450	9.1	0.014	850.94	850.8	Circular	2
LU23449-2	U23449	U23450	9.1	0.015	859.3	859.3	Natural	1
LU23450-1	U23450	U23445	132.6	0.014	850.8	847.3	Circular	2
LU23450-2	U23450	U23445	132.6	0.015	859.3	854.3	Natural	1
LU23453-1	U23453	U23449	22.2	0.014	851.3	850.94	Circular	2
LU23453-2	U23453	U23449	22.2	0.015	859.3	859.3	Natural	1
LU23453-3	U23453	U24190	659	0.015	859.3	854.8	Natural	1
LU23456-1	U23456	U23453	30.1	0.014	852.3	851.3	Circular	2
LU23456-2	U23456	U23453	30.1	0.015	859.3	859.3	Natural	1
LU23458-1	U23458	U23456	26.3	0.014	852.8	852.3	Circular	2
LU23458-2	U23458	U23456	26.3	0.015	859.8	859.3	Natural	1
LU23468-1	U23468	U23458	126.6	0.014	854.1	852.8	Circular	2
LU23468-2	U23468	U23458	126.6	0.015	861.3	859.8	Natural	1
LU23480-1	U23480	U23468	168.3	0.014	854.73	854.1	Circular	2
LU23480-2	U23480	U23468	168.3	0.015	863.3	861.3	Natural	1
LU23480-3	U23480	U24206-1	658.25	0.015	863.3	858.3	Natural	1
LU23482-1	U23482	U23480	17.6	0.014	854.8	854.73	Circular	2
LU23482-2	U23482	U23480	17.6	0.015	863.4	863.3	Natural	1
LU23496-1	U23496	U23482	142.5	0.014	855.86	854.8	Circular	1.75
LU23496-2	U23496	U23482	142.5	0.015	863.8	863.3	Natural	1
LU23501-1	U99998	U23496	165	0.014	857.5	855.86	Circular	1.75
LU23501-2	U99998	U23496	165	0.015	864.3	863.8	Natural	1
LU23502-1	U23502	U23501	25.9	0.014	857.8	857.54	Circular	1.75
LU23502-2	U23502	U23501	25.9	0.015	864.6	864.5	Natural	1
LU23512-1	U23512	U23502	104.4	0.014	858.56	857.8	Circular	1.75
LU23512-2	U23512	U23502	104.4	0.015	864.7	864.6	Natural	1
LU23515-1	U23515	U23512	38	0.014	858.84	858.56	Circular	1.75
LU23515-2	U23515	U23512	38	0.015	864.8	864.7	Natural	1
LU23526-1	U23526	U23515	159.1	0.014	860	858.84	Circular	1.75
LU23526-2	U23526	U23515	159.1	0.015	865.3	864.8	Natural	1
LU23527-1	U23527	U23526	32.1	0.014	860	860	Circular	1.25
LU23527-2	U23527	U23526	32.1	0.015	865.3	865.3	Natural	1
LU23533-1	U23533	U23527	143.4	0.014	861.24	860	Circular	1.25
LU23533-2	U23533	U23527	143.4	0.015	867.8	865.3	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU23537-1	U23537	U23533	121.8	0.014	862.3	861.24	Circular	1.25
LU23537-2	U23537	U23533	121.8	0.015	869.3	867.8	Natural	1
LU23539-1	U23539	U23537	50	0.014	863.3	862.3	Circular	1.25
LU23539-2	U23539	U23537	50	0.015	870.3	869.3	Natural	1
LU23597-1	U23597	U99997	17.5	0.014	858.3	857.3	Circular	1.5
LU23597-2	U23597	U99997	17.5	0.015	864.6	864.6	Natural	1
LU23733-1	U23733-1	U23597	286.1	0.014	859.8	858.3	Circular	1.5
LU23733-2	U23733-1	U23597	286.1	0.015	862.1	864.6	Natural	1
LU23784-1	U23765	U23819	114	0.014	842.3	857.55	Circular	1
LU23784-2	U23765	U23819	114	0.015	851.3	864.8	Natural	1
LU23790-1	U23790	U24078	150.4	0.014	849.3	848.3	Circular	0.75
LU23790-2	U23790	U24078	150.4	0.015	854.3	854.4	Natural	1
LU23819-1	U23819	U24098	80	0.014	857.55	857.15	Circular	0.75
LU23819-2	U23819	U24098	80	0.015	864.8	864.3	Natural	1
LU23888	U23888	44TH_ORIF	68	0.014	816.57	815.98	Circular	4
LU24078-1	U24078	U24145	10.5	0.014	848.3	848.23	Circular	1
LU24078-2	U24078	U24145	10.5	0.015	854.4	854.55	Natural	1
LU24098-1	U24098	U24220	21.1	0.014	857.15	857.05	Circular	0.75
LU24098-2	U24098	U24220	21.1	0.015	864.3	863.9	Natural	1
LU24127-1	U24127	U23888	85	0.014	845.3	825	Circular	1.75
LU24127-2	U24127	U23888	85	0.015	854.3	831.7	Natural	1
LU24145-1	U24145	U24127	176.4	0.014	845.77	845.3	Circular	1.75
LU24145-2	U24145	U24127	176.4	0.015	854.55	854.3	Natural	1
LU24159-1	U24159	U24145	135.5	0.014	846.13	845.77	Circular	1.75
LU24159-2	U24159	U24145	135.5	0.015	854.8	854.55	Natural	1
LU24161-1	U24161	U24159	24.5	0.014	846.2	846.13	Circular	1.5
LU24161-2	U24161	U24159	24.5	0.015	854.8	854.7	Natural	1
LU24164-1	U24164	U24165	18.6	0.014	847	847	Circular	1.5
LU24164-2	U24164	U24165	18.6	0.015	854.9	854.8	Natural	1
LU24165-1	U24165	U24161	23.4	0.014	847	846.2	Circular	1.5
LU24165-2	U24165	U24161	23.4	0.015	854.8	854.7	Natural	1
LU24165-3	U24165	U24793	660.44	0.015	854.8	846.3	Natural	1
LU24176-1	U24176	U24164	123.8	0.014	847.3	847	Circular	1.5
LU24176-2	U24176	U24164	123.8	0.015	854.85	854.9	Natural	1
LU24190-1	U24190	U24176	163.7	0.014	847.7	847.3	Circular	1.5
LU24190-2	U24190	U24176	163.7	0.015	854.8	854.75	Natural	1
LU24190-3	U24190	U24812	660.05	0.015	854.8	853.3	Natural	0.5
LU24191-1	U24191	U24190	55.2	0.014	847.9	847.7	Circular	1.25
LU24191-2	U24191	U24190	55.2	0.015	855.1	854.8	Natural	1
LU24201-1	U24201	U24191	123.8	0.014	848.8	847.9	Circular	1.25
LU24201-2	U24201	U24191	123.8	0.015	855.3	855.1	Natural	1
LU24206-1	U24206-1	U24201	155.1	0.014	851.3	848.8	Circular	1.25
LU24206-2	U24206-1	U24201	155.1	0.015	858.3	855.3	Natural	1
LU24211-1	U24211	U24206-1	35.4	0.014	852.3	851.3	Circular	1.25

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU24211-2	U24211	U24206-1	35.4	0.015	858.3	858.3	Natural	1
LU24220-1	U24220	U24211	143.4	0.014	856.79	852.3	Circular	1
LU24220-2	U24220	U24211	143.4	0.015	863.9	858.3	Natural	1
LU24237-1	U24237	U24220	179.3	0.014	862.1	856.79	Circular	1
LU24237-2	U24237	U24220	179.3	0.015	868.3	863.9	Natural	1
LU24252-1	U24252	U24237	314.6	0.014	880.37	862.1	Circular	1
LU24252-2	U24252	U24237	314.6	0.015	888.3	868.3	Natural	1
LU24254-1	U24254	U24252	35.3	0.014	881.07	880.37	Circular	1
LU24254-2	U24254	U24252	35.3	0.015	888.3	888.3	Natural	1
LU24461-1	U24461	U24515	204.9	0.014	872.58	871.81	Circular	1
LU24461-2	U24461	U24515	204.9	0.015	877.48	876.77	Natural	1
LU24515-1	U24515	U24876	206.1	0.014	871.81	870.75	Circular	1
LU24515-2	U24515	U24876	206.1	0.015	876.77	876.3	Natural	1
LU24771	U24771	45TH_ORIF	52	0.014	818.48	818.04	Circular	4
LU24775-1	U24775	U24779	12.8	0.014	839.42	839.39	Circular	2
LU24775-2	U24775	U24779	12.8	0.015	852.3	852.3	Natural	1
LU24779-1	U24779	U24771	34.2	0.014	839.39	839.3	Circular	2
LU24779-2	U24779	U24771	34.2	0.015	852.3	852.4	Natural	1
LU24784-1	U24784	U24775	162.6	0.014	839.82	839.42	Circular	2
LU24784-2	U24784	U24775	162.6	0.015	847.3	852.3	Natural	1
LU24793-1	U24793	U24864	10	0.014	840.3	838.65	Circular	2
LU24793-2	U24793	U24864	10	0.015	846.3	846.4	Natural	1
LU24794-1	U24794	U24793	29.8	0.014	840.75	840.3	Circular	1.5
LU24794-2	U24794	U24793	29.8	0.015	846.8	846.3	Natural	1
LU24797-1	U24797	U24794	136.3	0.014	842.83	840.75	Circular	1.5
LU24797-2	U24797	U24794	136.3	0.015	849.8	846.8	Natural	1
LU24805-1	U24805	U24797	135.7	0.014	844.9	842.83	Circular	1.5
LU24805-2	U24805	U24797	135.7	0.015	853.3	849.8	Natural	1
LU24811-1	U24811	U24805	26.6	0.014	845.3	844.9	Circular	1.5
LU24811-2	U24811	U24805	26.6	0.015	853.3	853.3	Natural	1
LU24812-1	U24812	U24811	9.4	0.014	845.52	845.3	Circular	1.333
LU24812-2	U24812	U24811	9.4	0.015	853.3	853.3	Natural	1
LU24816-1	U24816	U24812	25.4	0.014	846.1	845.52	Circular	1.333
LU24816-2	U24816	U24812	25.4	0.015	853.3	853.3	Natural	1
LU24817-1	U24817	U24816	8	0.014	846.7	846.1	Circular	1.333
LU24817-2	U24817	U24816	8	0.015	853.3	853.3	Natural	1
LU24819-1	U24819	U24817	12.8	0.014	846.8	846.7	Circular	1.333
LU24819-2	U24819	U24817	12.8	0.015	854.3	853.3	Natural	1
LU24824-1	U24824	U24819	129.6	0.014	849.56	846.8	Circular	1
LU24824-2	U24824	U24819	129.6	0.015	856.8	854.3	Natural	1
LU24837-1	U24837	U24824	175.2	0.014	853.3	849.56	Circular	1
LU24837-2	U24837	U24824	175.2	0.015	860.3	856.8	Natural	1
LU24845-1	U24845	U24771	39.7	0.014	836.5	833.87	Circular	2
LU24845-2	U24845	U24771	39.7	0.015	852.3	852.4	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU24856-1	U24856	U24845	165.6	0.014	837.91	837.17	Circular	2
LU24856-2	U24856	U24845	165.6	0.015	847.3	852.3	Natural	1
LU24864-1	U24864	U24856	158.8	0.014	838.65	837.91	Circular	2
LU24864-2	U24864	U24856	158.8	0.015	846.3	847.3	Natural	1
LU24869-1	U24869	U24874	142.1	0.014	876.3	870.25	Circular	1
LU24869-2	U24869	U24874	142.1	0.015	884.8	876.3	Natural	1
LU24871-1	U24871	U24875	146.5	0.014	869.81	869.3	Circular	1.75
LU24871-2	U24871	U24875	146.5	0.015	875.8	875.3	Natural	1
LU24874-1	U24874	U24908	22.2	0.014	870.25	869.3	Circular	1
LU24874-2	U24874	U24908	22.2	0.015	876.3	875.3	Natural	1
LU24875-1	U24875	U24908	21.5	0.014	869.3	869.3	Circular	1.75
LU24875-2	U24875	U24908	21.5	0.015	875.3	875.2	Natural	1
LU24876-1	U24876	U24871	165	0.014	870.3	869.81	Circular	1.75
LU24876-2	U24876	U24871	165	0.015	876.3	875.8	Natural	1
LU24878-1	U24878	U24876	30.1	0.014	870.38	870.3	Circular	1.5
LU24878-2	U24878	U24876	30.1	0.015	876.3	876.3	Natural	1
LU24884-1	U24884	U24935	27.8	0.014	870.42	870.21	Circular	1
LU24884-2	U24884	U24935	27.8	0.015	874.3	874.3	Natural	1
LU24885-1	U24885	U24878	156	0.014	870.77	870.38	Circular	1.5
LU24885-2	U24885	U24878	156	0.015	877.3	876.3	Natural	1
LU24889-1	U24889	U24885	149	0.014	871.21	870.77	Circular	1.5
LU24889-2	U24889	U24885	149	0.015	878.3	877.3	Natural	1
LU24890-1	U24890	U24869	142.3	0.014	877.3	876.3	Circular	1
LU24890-2	U24890	U24869	142.3	0.015	883.55	884.8	Natural	1
LU24891-1	U24891	U24889	35.7	0.014	871.8	871.21	Circular	1
LU24891-2	U24891	U24889	35.7	0.015	878.3	878.3	Natural	1
LU24897-1	U24897	U24891	147.8	0.014	872.53	871.8	Circular	1
LU24897-2	U24897	U24891	147.8	0.015	879.3	878.3	Natural	1
LU24901-1	U24901	U24897	154.4	0.014	873.3	872.53	Circular	1
LU24901-2	U24901	U24897	154.4	0.015	880.3	879.3	Natural	1
LU24901-3	U24901	U24884	350.05	0.015	880.3	874.3	Natural	1
LU24908-1	U24908	U24971	189	0.014	869.3	868.54	Circular	2
LU24908-2	U24908	U24971	189	0.015	875.7	875.6	Natural	1
LU24917	U24917	U24871	21.8	0.014	869.92	869.81	Circular	1
LU24935-1	U24935	U24985	332.2	0.014	869.5	868.54	Circular	1
LU24935-2	U24935	U24985	332.2	0.015	874.3	873.8	Natural	1
LU24966	U24966	U24917	129	0.014	870.54	869.92	Circular	1
LU24971-1	U24971	U24978	68.9	0.014	868.54	868.25	Circular	2
LU24971-2	U24971	U24978	68.9	0.015	875.6	875.5	Natural	1
LU24978-1	U24978	U25000	125.3	0.014	868.25	867.75	Circular	2
LU24978-2	U24978	U25000	125.3	0.015	875.5	874.4	Natural	1
LU24985-1	U24985	U25437	332.3	0.014	868.54	867.5	Circular	1
LU24985-2	U24985	U25437	332.3	0.015	873.8	873.3	Natural	1
LU24987-1	U24987	U25000	176	0.014	869.3	867.8	Circular	0.75

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU24987-2	U24987	U25000	176	0.015	873.3	875.2	Natural	1
LU24988-1	U24988	U24837	388.9	0.014	861.25	854.15	Circular	1
LU24988-2	U24988	U24837	388.9	0.015	868.2	860.3	Natural	1
LU25000-1	U25000	U25237	232.9	0.014	867.75	867.33	Circular	2
LU25000-2	U25000	U25237	232.9	0.015	874.4	874.3	Natural	1
LU25002-1	U25002	U24988	182	0.014	869.3	862.3	Circular	0.75
LU25002-2	U25002	U24988	182	0.015	874.3	868.2	Natural	1
LU25237-1	U25237	U25327	19.6	0.014	867.33	867.3	Circular	2
LU25237-2	U25237	U25327	19.6	0.015	874.4	874.3	Natural	1
LU25262	U25262	B5564	65	0.014	820.27	819.66	Circular	2.25
LU25273-1	U25273	U25262	144.6	0.014	853.72	853.3	Circular	2.25
LU25273-2	U25273	U25262	144.6	0.015	860.8	859.3	Natural	1
LU25286-1	U25286	U25273	165.9	0.014	854.2	853.72	Circular	2.25
LU25286-2	U25286	U25273	165.9	0.015	862.3	860.8	Natural	1
LU25290-1	U25290	U25286	21.9	0.014	855.3	854.2	Circular	2.25
LU25290-2	U25290	U25286	21.9	0.015	862.3	862.3	Natural	1
LU25290-3	U25290	U24793	658.51	0.015	862.3	846.3	Natural	1
LU25296-1	U25296	U25290	138.9	0.014	856.93	855.3	Circular	2
LU25296-2	U25296	U25290	138.9	0.015	864.8	862.3	Natural	1
LU25299-1	U25301	U25296	159.2	0.014	858.8	856.93	Circular	2
LU25299-2	U25301	U25296	159.2	0.015	867.65	864.8	Natural	1
LU25301-3	U25301	U25888	656.28	0.015	867.65	865.3	Natural	1
LU25303-1	U25303	U25301	33.3	0.014	860.6	858.8	Circular	2
LU25303-2	U25303	U25301	33.3	0.015	867.8	867.65	Natural	1
LU25304-1	U25304	U25303	20.6	0.014	860.8	860.6	Circular	2
LU25304-2	U25304	U25303	20.6	0.015	868.3	867.8	Natural	1
LU25310-1	U25310	U25304	131	0.014	862.41	860.8	Circular	2
LU25310-2	U25310	U25304	131	0.015	869.3	868.3	Natural	1
LU25313-1	U25313	U25310	85	0.014	863.45	862.41	Circular	2
LU25313-2	U25313	U25310	85	0.015	871.3	869.3	Natural	1
LU25314-1	U25314	U25313	69.1	0.014	863.7	863.45	Circular	2
LU25314-2	U25314	U25313	69.1	0.015	871.8	871.3	Natural	1
LU25314-3	U25314	U25936	660.01	0.015	871.8	866.3	Natural	1
LU25315-1	U25315	U25330	146.1	0.014	866.89	866.5	Circular	2
LU25315-2	U25315	U25330	146.1	0.015	873.8	873.3	Natural	1
LU25316-1	U25316	U25314	43.8	0.014	865.5	863.7	Circular	2
LU25316-2	U25316	U25314	43.8	0.015	872.8	871.8	Natural	1
LU25327-1	U25327	U25315	156.1	0.014	867.3	866.89	Circular	2
LU25327-2	U25327	U25315	156.1	0.015	874.3	873.8	Natural	1
LU25327-3	U25327	U25965	666	0.015	874.3	868.3	Natural	1
LU25330-1	U25330	U25347	96.3	0.014	866.5	866.22	Circular	2
LU25330-2	U25330	U25347	96.3	0.015	873.3	873.05	Natural	1
LU25330-3	U25330	U25955	662	0.015	873.3	867.3	Natural	1
LU25333-1	U25333	U25316	131.2	0.014	865.83	865.5	Circular	2

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU25333-2	U25333	U25316	131.2	0.015	872.8	872.8	Natural	1
LU25347-1	U25347	U25333	96.8	0.014	866.22	865.83	Circular	2
LU25347-2	U25347	U25333	96.8	0.015	873.05	872.8	Natural	1
LU25374-1	U25374	U25377	31.3	0.014	871.7	871.69	Circular	1
LU25374-2	U25374	U25377	31.3	0.015	878.3	878.3	Natural	1
LU25377-1	U25377	U25379	37.2	0.014	871.69	871.3	Circular	1
LU25377-2	U25377	U25379	37.2	0.015	878.3	877.8	Natural	1
LU25379-1	U25379	U25385	120.1	0.014	871.3	870.62	Circular	1
LU25379-2	U25379	U25385	120.1	0.015	877.8	876.3	Natural	1
LU25385-1	U25385	U25390	147.7	0.014	870.62	868.9	Circular	1
LU25385-2	U25385	U25390	147.7	0.015	876.3	874.3	Natural	1
LU25390-1	U25390	U25395	188.8	0.014	868.9	868.33	Circular	1.25
LU25390-2	U25390	U25395	188.8	0.015	874.3	873.8	Natural	1
LU25390-3	U25390	U25991	657	0.015	874.3	871.3	Natural	1
LU25395-1	U25395	U25403	139.7	0.014	868.33	867.9	Circular	1.25
LU25395-2	U25395	U25403	139.7	0.015	873.8	873.3	Natural	1
LU25401-1	U25401	U25437	32.4	0.014	867.35	867.3	Circular	1
LU25401-2	U25401	U25437	32.4	0.015	873.3	873.3	Natural	1
LU25403-1	U25403	U25437	32.7	0.014	867.9	867.3	Circular	1.25
LU25403-2	U25403	U25437	32.7	0.015	873.3	873.3	Natural	1
LU25405-1	U25405	U25401	136	0.014	867.85	867.35	Circular	1
LU25405-2	U25405	U25401	136	0.015	873.5	873.3	Natural	1
LU25410-1	U25410	U25405	136.9	0.014	868.3	867.85	Circular	1
LU25410-2	U25410	U25405	136.9	0.015	874.3	873.5	Natural	1
LU25437-1	U25437	U25515	232.2	0.014	867.3	866.57	Circular	1.5
LU25437-2	U25437	U25515	232.2	0.015	873.3	872.8	Natural	1
LU25490-1	U25490	U25527	181	0.014	862.8	861.8	Circular	0.75
LU25490-2	U25490	U25527	181	0.015	867.1	867.5	Natural	1
LU25515-1	U25515	U25560	223.9	0.014	866.57	865.86	Circular	1.5
LU25515-2	U25515	U25560	223.9	0.015	872.8	872.65	Natural	1
LU25527-1	U25527	U25555	158	0.014	861.8	860.8	Circular	0.75
LU25527-2	U25527	U25555	158	0.015	867.5	870	Natural	1
LU25555-1	U25555	U25921	166	0.014	860.8	859.8	Circular	0.75
LU25555-2	U25555	U25921	166	0.015	870	866	Natural	1
LU25557-1	47_LY ALL	U25560	163	0.014	870.8	868.3	Circular	1.25
LU25557-2	47_LY ALL	U25560	163	0.015	875.5	872.65	Natural	1
LU25559-1	U25559	U25984	185	0.014	865.55	864.55	Circular	0.75
LU25559-2	U25559	U25984	185	0.015	869.95	870.8	Natural	1
LU25560-1	U25560	U25998	180.8	0.014	865.86	865.3	Circular	1.5
LU25560-2	U25560	U25998	180.8	0.015	872.65	872.3	Natural	1
LU25857	U25857	47TH_ORIF	31	0.014	823.15	822.94	Circular	6
LU25863	U25863	U25857	43	0.014	845	844.66	Circular	6
LU25880-1	U25880	U25863	144.5	0.014	850.23	848.3	Circular	3
LU25880-2	U25880	U25863	144.5	0.015	861.8	859.3	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU25888-1	U25888	U25893	136.4	0.014	854.35	853.58	Circular	3
LU25888-2	U25888	U25893	136.4	0.015	865.3	864.8	Natural	1
LU25890-1	U25890	U25880	192.1	0.014	852.8	850.23	Circular	3
LU25890-2	U25890	U25880	192.1	0.015	864.3	861.8	Natural	1
LU25893-1	U25893	U25890	138.9	0.014	853.58	852.8	Circular	3
LU25893-2	U25893	U25890	138.9	0.015	864.8	864.3	Natural	1
LU25895-1	U25895	U25888	80.2	0.014	854.8	854.35	Circular	3
LU25895-2	U25895	U25888	80.2	0.015	865.4	865.3	Natural	1
LU25921-1	U25921	U25895	130.8	0.014	856.05	854.8	Circular	3
LU25921-2	U25921	U25895	130.8	0.015	866	865.3	Natural	1
LU25934-1	U25934	U25936	31.8	0.014	857.8	857.5	Circular	3
LU25934-2	U25934	U25936	31.8	0.015	866.4	866.3	Natural	1
LU25936-1	U25936	U25921	152.1	0.014	857.5	856.05	Circular	3
LU25936-2	U25936	U25921	152.1	0.015	866.3	866	Natural	1.5
LU25948-1	U25948	U25934	143.5	0.014	858.25	857.8	Circular	3
LU25948-2	U25948	U25934	143.5	0.015	867.05	866.3	Natural	1
LU25955-1	U25955	U25948	191.1	0.014	858.6	858.25	Circular	3
LU25955-2	U25955	U25948	191.1	0.015	867.3	867.05	Natural	1
LU25957-1	U25957	U25955	144.3	0.014	858.94	858.6	Circular	3
LU25957-2	U25957	U25955	144.3	0.015	867.95	867.3	Natural	1
LU25965-1	U25965	U25957	159.4	0.014	859.42	858.94	Circular	3
LU25965-2	U25965	U25957	159.4	0.016	868.3	867.95	Natural	1
LU25967-1	U25967	U25965	30.4	0.014	859.5	859.42	Circular	3
LU25967-2	U25967	U25965	30.4	0.015	868.4	868.3	Natural	1
LU25972-1	U25972	U25967	140.1	0.014	860.66	859.5	Circular	3
LU25972-2	U25972	U25967	140.1	0.015	868.8	868.3	Natural	1
LU25973-1	U25973	U25972	163.5	0.014	862.02	860.66	Circular	3
LU25973-2	U25973	U25972	163.5	0.015	869.3	868.8	Natural	1
LU25976-1	U25976	U25973	31.5	0.014	862.35	862.02	Circular	3
LU25976-2	U25976	U25973	31.5	0.015	869.4	869.3	Natural	1
LU25980-1	U25980	U25976	147.8	0.014	862.74	862.35	Circular	3
LU25980-2	U25980	U25976	147.8	0.015	869.8	869.3	Natural	1
LU25981-1	U25981	U25980	142.3	0.014	863.16	862.74	Circular	3
LU25981-2	U25981	U25980	142.3	0.015	870.3	869.8	Natural	1
LU25983-1	U25983	U25981	47.4	0.014	863.3	863.16	Circular	3
LU25983-2	U25983	U25981	47.4	0.015	870.3	870.2	Natural	1
LU25984-1	U25984	U25983	138.4	0.014	863.63	863.3	Circular	2
LU25984-2	U25984	U25983	138.4	0.015	870.8	870.3	Natural	1
LU25990-1	U25990	U25991	31.8	0.014	864.12	864	Circular	2
LU25990-2	U25990	U25991	31.8	0.015	871.4	871.3	Natural	1
LU25991-1	U25991	U25984	162.1	0.014	864	863.63	Circular	2
LU25991-2	U25991	U25984	162.1	0.015	871.3	870.8	Natural	1
LU25994-1	U25994	U25990	142.6	0.014	864.67	864.12	Circular	2
LU25994-2	U25994	U25990	142.6	0.015	871.8	871.3	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU25998-1	U25998	U25994	162	0.014	865.3	864.67	Circular	2
LU25998-2	U25998	U25994	162	0.015	872.3	871.8	Natural	1
LU25999-1	U25999	U25998	27.4	0.014	866.53	865.3	Circular	1.25
LU25999-2	U25999	U25998	27.4	0.015	872.4	872.3	Natural	1
LU26011-1	U26011	U25999	134.8	0.014	872.6	866.53	Circular	1.25
LU26011-2	U26011	U25999	134.8	0.015	879.3	872.3	Natural	1
LU26013-1	U26013	U26011	96.8	0.014	878.04	872.6	Circular	1.25
LU26013-2	U26013	U26011	96.8	0.015	883.8	879.3	Natural	1
LU26017-1	U26017	U26018	32.8	0.014	878.82	878.3	Circular	1.25
LU26017-2	U26017	U26018	32.8	0.015	886.3	885.8	Natural	1
LU26018-1	U26018	U26013	41.9	0.014	878.3	878.04	Circular	1.25
LU26018-2	U26018	U26013	41.9	0.015	885.8	883.8	Natural	1
LU26020-1	U26020	U26017	25.4	0.014	879.23	878.82	Circular	1.25
LU26020-2	U26020	U26017	25.4	0.015	886.3	886.3	Natural	1
LU26020-3	U26020	U25410	661.46	0.015	886.3	874.3	Natural	1
LU26022-1	U26022	U26020	35.4	0.014	879.8	879.23	Circular	1.25
LU26022-2	U26022	U26020	35.4	0.015	887.3	886.3	Natural	1
LU26024-1	U26024	U26022	127.1	0.014	885.3	879.8	Circular	1
LU26024-2	U26024	U26022	127.1	0.015	892.3	887.3	Natural	1
LU26029-1	U26029	U26024	159.9	0.014	887.3	885.3	Circular	1
LU26029-2	U26029	U26024	159.9	0.015	894.3	892.3	Natural	1
LU26067-1	U26067	U25981	32.2	0.014	863.45	863.3	Circular	2
LU26067-2	U26067	U25981	32.2	0.015	870.3	870.2	Natural	1
LU26106-1	U26106	U25957	74.2	0.014	860.05	859.05	Circular	0.75
LU26106-2	U26106	U25957	74.2	0.015	866.95	867.95	Natural	1
LU26125-1	U26125	U26067	163	0.014	864.21	863.45	Circular	2
LU26125-2	U26125	U26067	163	0.015	870.95	870.3	Natural	1
LU26127-1	U26127	U25948	217	0.014	860.73	859.6	Circular	0.75
LU26127-2	U26127	U25948	217	0.015	865.3	867.05	Natural	1
LU26132-1	U26132	U26125	44	0.014	864.41	864.21	Circular	2
LU26132-2	U26132	U26125	44	0.015	871.05	870.95	Natural	1
LU26165-1	U26165	U26132	188.5	0.014	864.96	864.41	Circular	2
LU26165-2	U26165	U26132	188.5	0.015	871.55	871.05	Natural	1
LU26167-1	U26167	U26165	27.5	0.014	865.05	864.96	Circular	2
LU26167-2	U26167	U26165	27.5	0.015	871.56	871.55	Natural	1
LU26487-1	U26487	U26167	211.2	0.014	865.6	865.05	Circular	2
LU26487-2	U26487	U26167	211.2	0.015	872.3	871.55	Natural	1
LU26513-1	U26513	U26516	160.9	0.014	878.3	871.7	Circular	1.25
LU26513-2	U26513	U26516	160.9	0.015	885.3	878.8	Natural	1
LU26516-1	U26516	U26521	125.2	0.014	871.7	866.55	Circular	1.25
LU26516-2	U26516	U26521	125.2	0.015	878.8	873.3	Natural	1
LU26521-1	U26521	U26487	33.2	0.014	866.55	865.6	Circular	1.25
LU26521-2	U26521	U26487	33.2	0.015	873.3	872.3	Natural	1
LU26552-1	U26552	U26487	158.8	0.014	871.33	865.6	Circular	1.25

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU26552-2	U26552	U26487	158.8	0.015	878.8	872.3	Natural	1
LU26555-1	U26555	U26552	118.6	0.014	875.6	871.33	Circular	1.25
LU26555-2	U26555	U26552	118.6	0.015	882.3	878.8	Natural	1
LU26556-1	U26556	U26555	64.7	0.014	879.3	875.6	Circular	1.25
LU26556-2	U26556	U26555	64.7	0.015	885.3	882.3	Natural	1
LU26556-3	U26556	U25991	675.17	0.015	885.3	871.3	Natural	1
LU26558-1	U26558	U26556	149.1	0.014	882.83	879.3	Circular	1.25
LU26558-2	U26558	U26556	149.1	0.015	889.3	885.3	Natural	1
LU26560-1	U26560	U26513	27.7	0.014	878.8	878.3	Circular	1.25
LU26560-2	U26560	U26513	27.7	0.015	885.3	885.3	Natural	1
LU26560-3	U26560	U25976	680.42	0.015	885.3	869.3	Natural	0.5
LU26563-1	U26563	U26558	188.8	0.014	887.3	882.83	Circular	1.25
LU26563-2	U26563	U26558	188.8	0.015	893.3	889.3	Natural	1
LU26563-3	U26563	U25998	676.21	0.015	893.3	872.3	Natural	1
LU26565-1	U26565	U26563	141	0.014	894.5	887.3	Circular	1
LU26565-2	U26565	U26563	141	0.015	899.8	893.3	Natural	1
LU26570-1	U26570	U26565	139	0.014	898.8	894.5	Circular	1
LU26570-2	U26570	U26565	139	0.015	906.3	899.8	Natural	1
LU26570-3	U26570	U26020	674.95	0.015	906.3	886.3	Natural	1
LU26576-1	U26576	U26570	90.6	0.014	900.3	898.8	Circular	1
LU26576-2	U26576	U26570	90.6	0.015	906.3	906.3	Natural	1
LU26582-1	U26582	U26576	128.4	0.014	901.79	900.3	Circular	1
LU26582-2	U26582	U26576	128.4	0.015	908.3	906.3	Natural	1
LU26585-1	U26585	U26582	151.9	0.014	903.55	901.79	Circular	1
LU26585-2	U26585	U26582	151.9	0.015	910.3	908.3	Natural	1
LU26585-3	U26585	U26029	672.15	0.015	910.3	894.3	Natural	1
LU26629-1	U26629	U26487	48.5	0.014	872.6	866.3	Circular	0.75
LU26629-2	U26629	U26487	48.5	0.015	879.7	872.3	Natural	1
LU26652-1	U26652	U26560	144.4	0.014	882.73	878.8	Circular	1
LU26652-2	U26652	U26560	144.4	0.015	889.3	885.3	Natural	1
LU26697-1	U26697	U26652	131	0.014	886.3	882.73	Circular	1
LU26697-2	U26697	U26652	131	0.015	893.3	889.3	Natural	1
LU26704-1	U26704	U26705	172	0.014	877.3	875.3	Circular	0.75
LU26704-2	U26704	U26705	172	0.015	883.7	881.7	Natural	1
LU26705-1	U26705	U26629	268.1	0.014	875.3	872.6	Circular	0.75
LU26705-2	U26705	U26629	268.1	0.015	881.7	879.7	Natural	1
LU26724-1	U26724	U26697	124	0.014	887.98	886.3	Circular	1
LU26724-2	U26724	U26697	124	0.015	894.3	893.3	Natural	1
LU26732-1	U26732	U26724	45.9	0.014	888.6	887.98	Circular	1
LU26732-2	U26732	U26724	45.9	0.015	894.8	894.3	Natural	1
LU26739-1	U26739	U26732	24.1	0.014	889.3	888.6	Circular	1
LU26739-2	U26739	U26732	24.1	0.015	895.3	894.8	Natural	1
LU26773-1	U26773	U26739	53	0.014	890.3	889.3	Circular	1
LU26773-2	U26773	U26739	53	0.015	896.3	895.3	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LU27025-1	U27025	U26773	100	0.014	892.2	890.3	Circular	1
LU27025-2	U27025	U26773	100	0.015	898.3	896.3	Natural	1
LU27166-1	U27166	U27025	54.4	0.014	896.8	892.2	Circular	1
LU27166-2	U27166	U27025	54.4	0.015	901.3	898.3	Natural	1
LU27229-1	U27229	U27166	133.2	0.014	898.8	896.8	Circular	1
LU27229-2	U27229	U27166	133.2	0.015	905.3	901.3	Natural	1
LU27349-1	U27349	U27229	140	0.014	900.2	898.8	Circular	1
LU27349-2	U27349	U27229	140	0.015	907.8	905.3	Natural	1
LU27399-1	U27399	U27349	164.5	0.014	901.55	900.2	Circular	1
LU27399-2	U27399	U27349	164.5	0.015	910.1	907.8	Natural	1
LU27437-1	U27437	U27399	87.8	0.014	902.35	901.85	Circular	1
LU27437-2	U27437	U27399	87.8	0.015	912	910.1	Natural	1
LU27577-1	U27577	U27583	219.4	0.014	905.42	903.8	Circular	1
LU27577-2	U27577	U27583	219.4	0.015	910.9	914.55	Natural	1
LU27583-1	U27583	U27437	210	0.014	903.7	902.35	Circular	1
LU27583-2	U27583	U27437	210	0.015	914.55	912	Natural	1
LU27793-1	U27793	U27437	218.6	0.014	911.08	904.66	Circular	1
LU27793-2	U27793	U27437	218.6	0.015	919.3	912	Natural	1
LU99999-1	U24793	U24784	159.1	0.014	840.3	839.82	Circular	2
LU99999-2	U24793	U24784	159.1	0.015	846.3	847.3	Natural	1
LV13912-1.	V13912	V13973	74	0.014	868.34	867.89	Circular	1
LV13912-2.	V13912	V13973	74	0.015	873.55	873.41	Natural	1
LV13967-1.	V13967	V13972	149.9	0.014	867.98	867.27	Circular	0.75
LV13967-2.	V13967	V13972	149.9	0.015	872.7	873.41	Natural	1
LV13972-1.	V13972	V13973	13.6	0.014	867.27	867.21	Circular	1
LV13972-2.	V13972	V13973	13.6	0.015	873.41	873.41	Natural	1
LV13973-1.	V13973	V14497	293.3	0.014	867.21	866.78	Circular	1.25
LV13973-2.	V13973	V14497	293.3	0.015	873.41	872.82	Natural	1
LV14497-1.	V14497	V14594	171.1	0.014	866.71	866.2	Circular	1.75
LV14497-2	V14497	MH178	235	0.015	873.16	872.57	Natural	1
LV14497-2.	V14497	V14594	171.1	0.015	872.56	872.5	Natural	1
LV14500-1.	V14500-1	V14500-2	200.9	0.014	868.69	867.96	Circular	1.25
LV14500-2.	V14500-1	V14500-2	200.9	0.015	874.3	874.63	Natural	1
LV14521-1.	MH136	V14593	161	0.014	868.2	867.58	Circular	1.25
LV14521-2.	MH136	V14593	161	0.015	875.05	874.96	Natural	1
LV14593-1	V14593	V14709	196.8	0.014	867.58	867.01	Circular	1.25
LV14593-2	V14593	V14709	196.8	0.015	874.96	874.63	Natural	1
LV14594-1.	V14594	V14718	223.9	0.014	866.2	865.73	Circular	1.75
LV14594-2.	V14594	V14718	223.9	0.015	872.5	872.3	Natural	1
LV14618-1	V14500-2	V14722	200.6	0.014	867.96	867.63	Circular	1.25
LV14618-2	V14500-2	V14722	200.6	0.015	874.63	874.96	Natural	1
LV14625-1	V14625	V14721	193	0.014	871.55	870.55	Circular	0.75
LV14625-2	V14625	V14721	193	0.015	877.55	877.15	Natural	1
LV14709-1	V14709	V14976	201	0.014	867.01	866.44	Circular	1.25

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LV14709-2	V14709	V14976	201	0.015	874.63	874.3	Natural	1
LV14718-1	V14718	V15177	210.9	0.014	865.73	865.3	Circular	1.75
LV14718-2	V14718	V15177	210.9	0.015	872.3	874.3	Natural	1
LV14721-1	V14721	V15138	197	0.014	870.55	869.55	Circular	0.75
LV14721-2	V14721	V15138	197	0.015	877.15	874.8	Natural	1
LV14722-1	V14722	V14958	157.4	0.014	867.63	867.36	Circular	1.25
LV14722-2	V14722	V14958	157.4	0.015	874.96	875.3	Natural	1
LV14958-1	V14958	V15129	36.6	0.014	867.36	867.3	Circular	1.25
LV14958-2	V14958	V15129	36.6	0.015	875.3	875.3	Natural	1
LV14976-1	V14976	V15211	48.3	0.014	866.44	866.3	Circular	1.25
LV14976-2	V14976	V15211	48.3	0.015	874.3	874.25	Natural	1
LV15129-1	V15129	V15137	166.1	0.014	867.3	866.8	Circular	1.5
LV15129-2	V15129	V15137	166.1	0.015	875.3	874.8	Natural	1
LV15133-1	V15133	V15211	38.4	0.014	866.3	866.3	Circular	1
LV15133-2	V15133	V15211	38.4	0.015	874.3	874.3	Natural	1
LV15134-1	V15134	V15138	134.3	0.014	867.8	867.03	Circular	1
LV15134-2	V15134	V15138	134.3	0.015	875.3	874.8	Natural	1
LV15135-1	V15135	V15129	163.3	0.014	868.11	867.3	Circular	1
LV15135-2	V15135	V15129	163.3	0.015	875.05	875.3	Natural	1
LV15137-1	V15137	V15211	163.5	0.014	866.8	866.3	Circular	1.5
LV15137-2	V15137	V15211	163.5	0.015	874.8	874.3	Natural	1
LV15138-1	V15138	V15133	127.3	0.014	867.03	866.3	Circular	1
LV15138-2	V15138	V15133	127.3	0.015	874.8	874.3	Natural	1
LV15144-1	V15144	V15135	137.6	0.014	868.8	868.11	Circular	1
LV15144-2	V15144	V15135	137.6	0.015	874.8	875.05	Natural	1
LV15144-3	V15144	V15885	679.02	0.015	874.8	873.3	Natural	1
LV15177-1	V15177	V15330	229.9	0.014	865.3	864.86	Circular	2
LV15177-2	V15177	V15330	229.9	0.015	874.3	873.3	Natural	1
LV15177-3	V15177	M15102	426.26	0.015	874.3	869.3	Natural	1
LV15211-1	V15211	V15325	201	0.014	866.3	865.71	Circular	2
LV15211-2	V15211	V15325	201	0.015	874.3	873.3	Natural	1
LV15325-1	V15325	V15405	238.1	0.014	865.71	865.01	Circular	2
LV15325-2	V15325	V15405	238.1	0.015	873.3	872.3	Natural	1
LV15330-1	V15330	V15403	211	0.014	864.86	864.45	Circular	2
LV15330-2	V15330	V15403	211	0.015	873.3	872.6	Natural	1
LV15388-1	V15388	V15479	145	0.014	869.3	867.77	Circular	0.75
LV15388-2	V15388	V15479	145	0.015	873	873.3	Natural	1
LV15403-1	V15403	V15871	241	0.014	864.45	864	Circular	2
LV15403-2	V15403	V15871	241	0.015	872.6	872.3	Natural	1
LV15405-1	V15405	V15737	190.9	0.014	865.01	864.44	Circular	2
LV15405-2	V15405	V15737	190.9	0.015	872.3	871.3	Natural	1
LV15479-1	V15479	V15887	140	0.014	867.77	866.3	Circular	0.75
LV15479-2	V15479	V15887	140	0.015	873.3	872.8	Natural	1
LV15737-1	V15737	V15855	23.7	0.014	864.44	862.8	Circular	2

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LV15737-2	V15737	V15855	23.7	0.015	871.3	871.3	Natural	1
LV15855-1	V15855	V15943	24	0.014	862.8	862.3	Circular	2
LV15855-2	V15855	V15943	24	0.015	871.3	871.3	Natural	1
LV15871-1	V15871	V15884	163.5	0.014	864	863.46	Circular	2.25
LV15871-2	V15871	V15884	163.5	0.015	872.3	872.8	Natural	1
LV15871-3	V15871	L15870	425	0.015	872.3	871.3	Natural	1
LV15873-1	V15873	V15874	32.8	0.014	853.3	853.15	Circular	8
LV15873-2	V15873	V15874	32.8	0.015	863.3	863.15	Natural	1
LV15874-1	V15874	V15881	103.4	0.014	853.15	852.96	Circular	8
LV15874-2	V15874	V15881	103.4	0.015	863.15	864.3	Natural	1
LV15876-1	V15876	V15900	35.36	0.014	850.19	862.8	Circular	2.5
LV15876-2	V15876	V15900	35.4	0.015	867.08	868	Natural	1
LV15877-1	V15877	V15876	5.5	0.014	850.09	850.19	Circular	8
LV15877-2	V15877	V15876	5.5	0.015	867.08	867.08	Natural	1
LV15881-1	V15881	V15877	102.9	0.014	852.96	852.77	Circular	8
LV15881-2	V15881	V15877	102.9	0.015	864.3	867.08	Natural	1
LV15882-1	V15882	V15885	64.7	0.014	863.08	862.87	Circular	2.5
LV15882-2	V15882	V15885	64.7	0.015	873.3	873.3	Natural	1
LV15884-1	V15884	V15882	115.6	0.014	863.46	863.08	Circular	2.25
LV15884-2	V15884	V15882	115.6	0.015	872.8	873.3	Natural	1
LV15885-1	V15885	V15887	140.3	0.014	862.87	862.62	Circular	2.25
LV15885-2	V15885	V15887	140.3	0.015	873.3	872.8	Natural	1
LV15887-1	V15887	V15888	134.3	0.014	862.62	862.39	Circular	2.25
LV15887-2	V15887	V15888	134.3	0.015	872.8	872.3	Natural	1
LV15888-1	V15888	V15889	49.9	0.014	862.39	862.3	Circular	2.25
LV15888-2	V15888	V15889	49.9	0.015	872.3	872.3	Natural	1
LV15889-1	V15889	V15890	151.1	0.014	862.3	861.81	Circular	2.25
LV15889-2	V15889	V15890	151.1	0.015	872.3	871.8	Natural	1
LV15890-1	V15890	V15943	154.3	0.014	861.81	861.3	Circular	2.25
LV15890-2	V15890	V15943	154.3	0.015	871.8	871.3	Natural	1
LV15892-1	V15892	V15943	26.1	0.014	861.35	861.3	Circular	1.25
LV15892-2	V15892	V15943	26.1	0.015	871.3	871.3	Natural	1
LV15893-1	V15893	V15894	121.2	0.014	862.3	861.85	Circular	1.25
LV15893-2	V15893	V15894	121.2	0.015	868.66	869.8	Natural	1
LV15894-1	V15894	V15892	151.1	0.014	861.85	861.35	Circular	1.25
LV15894-2	V15894	V15892	151.1	0.015	869.8	871.3	Natural	1
LV15897-1	V15897	V15873	32.1	0.014	855.57	855.23	Circular	2
LV15897-2	V15897	V15873	32.1	0.015	863.64	863.3	Natural	1
LV15898-1	V15898	V15893	72.9	0.014	863.19	862.45	Circular	1
LV15898-2	V15898	V15893	72.9	0.015	868.78	868.66	Natural	1
LV15898-3	V15898	V15897	296	0.015	868.78	863.64	Natural	1
LV15900-1	V15900	V16025	41.1	0.014	862.8	862.7	Circular	2
LV15900-2	V15900	V16025	41.1	0.015	868	867.8	Natural	1
LV15943-1	V15943	V16089	237.9	0.014	861.3	860.92	Circular	3.75

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LV15943-2	V15943	V16089	237.9	0.015	871.3	870.96	Natural	1
LV16006-1	V16006	V15871	30.1	0.014	866.75	866.64	Circular	1
LV16006-2	V16006	V15871	30.1	0.015	872.3	872.3	Natural	1
LV16025-1	V16025	V16106	283	0.014	862.7	861.5	Circular	2.5
LV16025-2	V16025	V16106	283	0.015	867.8	870.67	Natural	1
LV16087-1	V16087	V16006	222.4	0.014	867.98	866.75	Circular	1
LV16087-2	V16087	V16006	222.4	0.015	872.3	872.3	Natural	1
LV16089-1	V16089	V16136	226.5	0.014	860.92	860.55	Circular	3.75
LV16089-2	V16089	V16136	226.5	0.015	870.96	870.63	Natural	1
LV16106-1	V16106	V16461	315	0.014	861.5	860.3	Circular	3
LV16106-2	V16106	V16461	315	0.015	870.67	873.4	Natural	1
LV16136-1	V16136	V16485	171.8	0.014	860.55	860.34	Circular	3.75
LV16136-2	V16136	V16485	171.8	0.015	870.63	870.45	Natural	1
LV16160-1	V16160	V16571	170	0.014	864.3	863.3	Circular	0.75
LV16160-2	V16160	V16571	170	0.015	867.4	870.6	Natural	1
LV16461-1	V16461	V16582	41.2	0.014	860.3	860	Circular	3
LV16461-2	V16461	V16582	41.2	0.015	873.4	873.4	Natural	1
LV16485-1	V16485	V16578	28.5	0.014	860.34	860.22	Circular	3.75
LV16485-2	V16485	V16578	28.5	0.015	870.45	870.3	Natural	1
LV16562-1	V16562	V16564	139.6	0.014	865.8	865.48	Circular	1.5
LV16562-2	V16562	V16564	139.6	0.015	873.3	872.8	Natural	1
LV16563-1	V16563	V16562	42.9	0.014	866.8	865.8	Circular	1
LV16563-2	V16563	V16562	42.9	0.015	873.3	873.3	Natural	1
LV16564-1	V16564	V16565	140.2	0.014	865.48	865.15	Circular	1.5
LV16564-2	V16564	V16565	140.2	0.015	872.8	872.3	Natural	1
LV16565-1	V16565	V16566	63.8	0.014	865.15	864.9	Circular	1.5
LV16565-2	V16565	V16566	63.8	0.015	872.3	872.3	Natural	1
LV16566-1	V16566	V16567	141.7	0.014	864.9	864.11	Circular	1.75
LV16566-2	V16566	V16567	141.7	0.015	872.3	871.8	Natural	1
LV16567-1	V16567	V16568	146.8	0.014	864.11	863.3	Circular	1.75
LV16567-2	V16567	V16568	146.8	0.015	871.8	871.3	Natural	1
LV16568-1	V16568	V16569	18.4	0.014	863.3	863.19	Circular	2.25
LV16568-2	V16568	V16569	18.4	0.015	871.3	871.3	Natural	1
LV16569-1	V16569	V16573	229.8	0.014	863.19	861.86	Circular	2.25
LV16569-2	V16569	V16573	229.8	0.015	871.3	870.3	Natural	1
LV16571-1	V16571	V16587	135.1	0.014	860.03	859.86	Circular	5
LV16571-2	V16571	V16587	135.1	0.015	870.6	869.3	Natural	1
LV16572-1	V16572	V16577	293.3	0.014	858.5	858.04	Circular	5
LV16572-2	V16572	V16577	293.3	0.015	871.3	870.3	Natural	1
LV16573-1	V16573	V16578	95.6	0.014	861.86	861.3	Circular	2.25
LV16573-2	V16573	V16578	95.6	0.015	870.3	870.3	Natural	1
LV16574-1	V16574	V16571	142.6	0.014	860.2	860.03	Circular	5
LV16574-2	V16574	V16571	142.6	0.015	870.3	870.6	Natural	1
LV16575-1	V16575	V16572	34.9	0.014	858.55	858.5	Circular	5

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LV16575-2	V16575	V16572	34.9	0.015	871.3	871.3	Natural	1
LV16577-1	V16577	VWEIR	0	0	0	0	Circular	0
LV16578-1	V16578	V16574	10.3	0.014	860.22	860.2	Circular	5
LV16578-2	V16578	V16574	10.3	0.015	870.3	870.3	Natural	1
LV16582-1	V16582	V16575	288.5	0.014	859.25	858.55	Circular	5
LV16582-2	V16582	V16575	288.5	0.015	873.4	871.3	Natural	1
LV16583-1	V16583	V16588	30.3	0.014	859.41	859.4	Circular	5
LV16583-2	V16583	V16588	30.3	0.015	870.3	870.3	Natural	1
LV16583-3	V16583	V15897	673	0.015	870.3	863.64	Natural	1
LV16584-1	V16584	V16582	39	0.014	859.27	859.25	Circular	5
LV16584-2	V16584	V16582	39	0.015	873.4	873.4	Natural	1
LV16587-1	V16587	V16590	26	0.014	859.86	859.82	Circular	5
LV16587-2	V16587	V16590	26	0.015	869.3	869.3	Natural	1
LV16588-1	V16588	V16584	295.4	0.014	859.4	859.27	Circular	5
LV16588-2	V16588	V16584	295.4	0.015	870.3	873.4	Natural	1
LV16589-1	V16589	V16591	17.8	0.014	859.77	859.75	Circular	5
LV16589-2	V16589	V16591	17.8	0.015	869.3	869.3	Natural	1
LV16589-3	V16590	V15898	675.07	0.015	869.3	868.78	Natural	1
LV16590-1	V16590	V16589	45.2	0.014	859.82	859.77	Circular	5
LV16590-2	V16590	V16589	45.2	0.015	869.3	869.3	Natural	1
LV16591-1	V16591	V16583	269.6	0.014	859.75	859.41	Circular	5
LV16591-2	V16591	V16583	269.6	0.015	869.3	870.3	Natural	1
LV16649-1	V16577	V16934	542	0.014	858	855.18	Circular	5
LV16649-2	V16577	V16934	542	0.015	870.3	862.6	Natural	1
LV16687-1	V16687	V16574	161.5	0.014	864.08	863.3	Circular	1.75
LV16687-2	V16687	V16574	161.5	0.015	871.3	870.3	Natural	1
LV16693-1	V16693	V16562	185.1	0.014	866.13	865.8	Circular	1.25
LV16693-2	V16693	V16562	185.1	0.015	872.97	873.3	Natural	1
LV16701-1	V16701	V16572	190	0.014	859.61	859.3	Circular	1.75
LV16701-2	V16701	V16572	190	0.015	869.55	871.3	Natural	1
LV16722-1	V16722	V16693	104.5	0.014	866.31	866.13	Circular	1.25
LV16722-2	V16722	V16693	104.5	0.015	872.8	872.97	Natural	1
LV16730-1	V16730	V16687	197.7	0.014	865.09	864.08	Circular	1.75
LV16730-2	V16730	V16687	197.7	0.015	872.3	871.3	Natural	1
LV16731-1	V16731	V16722	89.3	0.014	866.47	866.31	Circular	1.25
LV16731-2	V16731	V16722	89.3	0.015	872.63	872.8	Natural	1
LV16738-1	V16738	V16701	185.6	0.014	859.92	859.61	Circular	1.75
LV16738-2	V16738	V16701	185.6	0.015	867.8	869.55	Natural	1
LV1682	KINGS PND	SAN SEWER	50	0.014	844.3	844.2	Circular	1
LV16975-1	V16975	V16731	185.8	0.014	866.8	866.47	Circular	1.25
LV16975-2	V16975	V16731	185.8	0.015	872.3	872.63	Natural	1
LV16975-3	V16975	P17061	427.38	0.015	872.3	864.3	Natural	1
LV17039-1	V17039	V16738	185.5	0.014	860.22	859.92	Circular	1.75
LV17039-2	V17039	V16738	185.5	0.015	866.3	867.8	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LV17049-1	V17049	V16730	218.7	0.014	866.2	865.09	Circular	1.75
LV17049-2	V17049	V16730	218.7	0.015	873.3	872.3	Natural	1
LV17077-1	V16934	V17218	68	0.014	855.18	854.29	Circular	6
LV17077-2	V16934	V17218	68	0.015	862.6	862.55	Natural	1
LV17147-1	V17147	V17039	18.7	0.014	860.25	860.22	Circular	1.75
LV17147-2	V17147	V17039	18.7	0.015	866.3	866.3	Natural	1
LV17147-3	V17147	V17218	316.43	0.015	866.3	862.55	Natural	1
LV17149-1	V17149	V17151	301	0.014	857.61	856.27	Circular	2
LV17149-2	V17149	V17151	301	0.015	863.35	862.1	Natural	1
LV17150-1	V17150	V17149	33.2	0.014	857.75	857.61	Circular	2
LV17150-2	V17150	V17149	33.2	0.015	863.45	863.35	Natural	1
LV17150-3	V17150	V17846	661.01	0.015	863.45	860.2	Natural	1
LV17151-1	V17151	V17218	36.3	0.014	856.27	856.27	Circular	2
LV17151-2	V17151	V17218	36.3	0.015	862.1	862.05	Natural	1
LV17153-1	V17153	V17154	333.1	0.014	871.66	862.09	Circular	1
LV17153-2	V17153	V17154	333.1	0.015	875.3	866.6	Natural	1
LV17154-1	V17154	V17147	35.4	0.014	861.89	860.75	Circular	1
LV17154-2	V17154	V17147	35.4	0.015	866.6	866.3	Natural	1
LV17170-1	V17170	V17173	179.8	0.014	867.3	866.78	Circular	1
LV17170-2	V17170	V17173	179.8	0.015	874.3	873.8	Natural	1
LV17170-3	V17170	V16568	586.04	0.015	874.3	871.3	Natural	1
LV17173-1	V17173	V17049	161.4	0.014	866.78	866.3	Circular	1
LV17173-2	V17173	V17049	161.4	0.015	873.8	873.3	Natural	1
LV17178-1	V17178	V17049	172.9	0.014	866.73	866.3	Circular	1
LV17178-2	V17178	V17049	172.9	0.015	873.8	873.3	Natural	1
LV17180-1	V17180	V17178	133.6	0.014	867.06	866.73	Circular	1
LV17180-2	V17180	V17178	133.6	0.015	874.05	873.8	Natural	1
LV17182-1	V17182	V17180	95.4	0.014	867.3	867.06	Circular	1
LV17182-2	V17182	V17180	95.4	0.015	874.3	874.05	Natural	1
LV17182-3	V17182	V16589	586.34	0.015	874.3	869.3	Natural	1
LV17210-1	V17210	V17049	35.7	0.014	866.41	866.2	Circular	1.5
LV17210-2	V17210	V17049	35.7	0.015	873.3	873.3	Natural	1
LV17218-1	V17218	V17346	395	0.014	854.29	853.55	Special	4.5
LV17218-2	V17218	V17346	395	0.015	862.05	860.17	Natural	1
LV17219-1	V17219	V17147	34	0.014	860.3	860.25	Circular	1.75
LV17219-2	V17219	V17147	34	0.015	866.3	866.3	Natural	1
LV17275-1	V17275	V17210	170.1	0.014	866.92	866.41	Circular	1.5
LV17275-2	V17275	V17210	170.1	0.015	874.3	873.3	Natural	1
LV17285-1	V17285	V17219	206.1	0.014	860.61	860.3	Circular	1.5
LV17285-2	V17285	V17219	206.1	0.015	866.8	866.3	Natural	1
LV17295-1	V17295	V16975	292.8	0.014	868.09	867.05	Circular	1
LV17295-2	V17295	V16975	292.8	0.015	871.3	872.3	Natural	1
LV17334-1	V17334	V17275	214	0.014	867.56	866.92	Circular	1.5
LV17334-2	V17334	V17275	214	0.015	875.3	874.3	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LV17346-1	V17346	V17647	203.5	0.014	853.55	853.12	Special	4.5
LV17346-2	V17346	V17647	203.5	0.015	860.17	861.19	Natural	1
LV17353-1	V17353	V17285	206.1	0.014	860.91	860.61	Circular	1.5
LV17353-2	V17353	V17285	206.1	0.015	867.05	866.8	Natural	1
LV17354-1	V17354	V17842	181.3	0.014	855.5	854.4	Circular	0.75
LV17354-2	V17354	V17842	181.3	0.015	860.3	860.5	Natural	1
LV17538-1	V17538	V17353	169.6	0.014	861.16	860.91	Circular	1.5
LV17538-2	V17538	V17353	169.6	0.015	867.3	867.05	Natural	1
LV17647-1	V17647	V17947	79	0.014	853.12	852.95	Circular	5.5
LV17647-2	V17647	V17947	79	0.015	861.19	862.09	Natural	1
LV17785-1	V17785	V17538	37.3	0.014	862.55	861.16	Circular	1.5
LV17785-2	V17785	V17538	37.3	0.015	867.3	867.3	Natural	1
LV17785-3	V17785	V17947	324.23	0.015	867.3	862.09	Natural	1
LV17803-1	V17803	V17334	248.5	0.014	868.3	867.56	Circular	1.5
LV17803-2	V17803	V17334	248.5	0.015	876.3	875.3	Natural	1
LV17827-1	V17827	V17830	85	0.014	898.64	896.52	Circular	1
LV17827-2	V17827	V17830	85	0.015	901.7	901.1	Natural	1
LV17827-3	V17827	V18539	660.91	0.015	901.7	881.8	Natural	1
LV17828-1	V17828	V17831	293.8	0.014	883.97	857.59	Circular	1.25
LV17828-2	V17828	V17831	293.8	0.015	890.95	862.5	Natural	1
LV17830-1	V17830	V17833	323.6	0.014	895.52	887.35	Circular	1
LV17830-2	V17830	V17833	323.6	0.015	901.1	891.12	Natural	1
LV17831-1	V17831	V17832	49.4	0.014	857.5	857.28	Circular	2.5
LV17831-2	V17831	V17832	49.4	0.015	862.5	862.95	Natural	1
LV17832-1	V17832	V17835	140	0.014	857.28	856.6	Circular	2.5
LV17832-2	V17832	V17835	140	0.015	862.95	863.48	Natural	1
LV17833-1	V17833	V17828	40.6	0.014	884.74	884.21	Circular	1.25
LV17833-2	V17833	V17828	40.6	0.015	891.12	890.95	Natural	1
LV17835-1	V17835	V17839	140.6	0.014	854.85	854.15	Circular	2.5
LV17835-2	V17835	V17839	140.6	0.015	863.48	862.95	Natural	1
LV17839-1	V17839	V17840	28.9	0.014	854.15	854.01	Circular	3
LV17839-2	V17839	V17840	28.9	0.015	862.95	862.9	Natural	1
LV17840-1	V17840	V17846	295	0.014	854.01	853.09	Circular	3
LV17840-2	V17840	V17846	295	0.015	862.9	860.2	Natural	1
LV17841-1	V17841	V17947	71.1	0.014	852.18	852.08	Circular	3.5
LV17841-2	V17841	V17947	71.1	0.015	860.9	862.09	Natural	1
LV17842-1	V17842	V17841	125	0.014	852.53	852.28	Circular	3.5
LV17842-2	V17842	V17841	125	0.015	860.5	860.9	Natural	1
LV17843-1	V17843	V17842	123.8	0.014	852.95	852.53	Circular	3.5
LV17843-2	V17843	V17842	123.8	0.015	860	860.5	Natural	1
LV17846-1	V17846	V17843	52.7	0.014	853.09	852.95	Circular	3.5
LV17846-2	V17846	V17843	52.7	0.015	860	860.2	Natural	1
LV17863-1	V17863	V17866	141.1	0.014	869.3	868.84	Circular	1
LV17863-2	V17863	V17866	141.1	0.015	875.3	875.8	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LV17863-3	V17863	P17914	364.23	0.015	875.3	870.02	Natural	1
LV17866-1	V17866	V17803	167.8	0.014	868.84	868.3	Circular	1
LV17866-2	V17866	V17803	167.8	0.015	875.8	876.3	Natural	1
LV17868-1	V17868	V17803	15.9	0.014	868.59	868.3	Circular	1
LV17868-2	V17868	V17803	15.9	0.015	876.3	876.3	Natural	1
LV17869-1	V17869	V17868	123.8	0.014	869.43	868.59	Circular	1
LV17869-2	V17869	V17868	123.8	0.015	876.55	876.3	Natural	1
LV17870-1	V17870	V17869	128.5	0.014	870.3	869.43	Circular	1
LV17870-2	V17870	V17869	128.5	0.015	876.3	876.55	Natural	1
LV17872-1	V17872	V17874	116.7	0.014	867.71	867.37	Circular	1.25
LV17872-2	V17872	V17874	116.7	0.015	875.05	874.3	Natural	1
LV17874-1	V17874	V17875	23.8	0.014	867.37	866.63	Circular	1.25
LV17874-2	V17874	V17875	23.8	0.015	874.3	874.3	Natural	1
LV17875-1	V17875	V17880	39.9	0.014	866.63	866.63	Circular	1.25
LV17875-2	V17875	V17880	39.9	0.015	874.3	874.3	Natural	1
LV17875-3	V17875	P18460	649.43	0.015	874.3	870.3	Natural	1
LV17876-1	V17876	V17878	144.8	0.014	866.63	864.76	Circular	1.25
LV17876-2	V17876	V17878	144.8	0.015	874.3	870.8	Natural	1
LV17878-1	V17878	V17785	168.2	0.014	864.76	862.55	Circular	1.25
LV17878-2	V17878	V17785	168.2	0.015	870.8	867.3	Natural	1
LV17880-1	V17880	V17876	12.2	0.014	866.63	866.63	Circular	1.25
LV17880-2	V17880	V17876	12.2	0.015	874.3	874.3	Natural	1
LV17883-1	V17883	V17872	139.6	0.014	868.12	867.71	Circular	1.25
LV17883-2	V17883	V17872	139.6	0.015	875.3	875.05	Natural	1
LV17884-1	V17884	V17885	35.7	0.014	869.1	869	Circular	1.25
LV17884-2	V17884	V17885	35.7	0.015	875.3	875.3	Natural	1
LV17885-1	V17885	V17883	13.5	0.014	869	868.12	Circular	1.25
LV17885-2	V17885	V17883	13.5	0.015	875.3	875.3	Natural	1
LV17922-1	V17922	V17835	23.3	0.014	854.8	854.8	Circular	1
LV17922-2	V17922	V17835	23.3	0.015	863.1	863.48	Natural	1
LV17947-1	V17947	V17984	272.5	0.014	852.03	851.63	Circular	6
LV17947-2	V17947	V17984	272.5	0.015	862.09	867.11	Natural	1
LV17958-1	V17958	V17922	96	0.014	855.8	854.8	Circular	0.75
LV17958-2	V17958	V17922	96	0.015	860.3	863.1	Natural	1
LV17977-1	V17977	V17982	62.7	0.014	879.6	878.96	Circular	0.833
LV17977-2	V17977	V17982	62.7	0.015	885.55	885.3	Natural	1
LV17982-1	V17982	V17983	148.2	0.014	878.96	878.5	Circular	1.25
LV17982-2	V17982	V17983	148.2	0.015	885.3	884.19	Natural	1
LV17983-1	V17983	V18261	317	0.014	878.5	875.06	Circular	1
LV17983-2	V17983	V18261	317	0.015	884.19	879.11	Natural	1
LV17984-1	V17984	V18228	297.1	0.014	851.63	851	Circular	6
LV17984-2	V17984	V18228	297.1	0.015	867.11	869.5	Natural	1
LV18228-1	V18228	V18570	88.5	0.014	850.25	849.82	Circular	6
LV18228-2	V18228	V18570	88.5	0.015	869.5	869.3	Natural	1

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LV18248-1	V18248	V18645	172	0.014	861.87	861.01	Circular	1.5
LV18248-2	V18248	V18645	172	0.015	872.5	871.5	Natural	1
LV18261-1	V18261	V18551	60.5	0.014	875.06	874.48	Circular	1.25
LV18261-2	V18261	V18551	60.5	0.015	880.48	880.38	Natural	1
LV18538-1	V18538	V18539	369	0.014	881.19	876.39	Circular	1.25
LV18538-2	V18538	V18539	369	0.015	886.3	882	Natural	1
LV18539-1	V18539	V18551	260.2	0.014	876.04	874.61	Circular	2.25
LV18539-2	V18539	V18551	260.2	0.015	882	880.38	Natural	1
LV18545-1	V18545	V18548	165.9	0.014	861.5	860.27	Circular	3
LV18545-2	V18545	V18548	165.9	0.015	867.52	866.61	Natural	1
LV18546-1	V18546	V18570	14.4	0.014	858.2	857.93	Circular	3
LV18546-2	V18546	V18570	14.4	0.015	869	869.3	Natural	1
LV18547-1	V18547	V18545	195.2	0.014	862.92	861.5	Circular	2.5
LV18547-2	V18547	V18545	195.2	0.015	869.4	867.52	Natural	1
LV18547-3	V18547	V17840	684.84	0.015	869.4	862.9	Natural	1
LV18548-1	V18548	V18546	253.2	0.014	860.27	858.2	Circular	3
LV18548-2	V18548	V18546	253.2	0.015	866.61	869	Natural	1
LV18548-3	V18548	V17846	684.75	0.015	866.61	860.2	Natural	1
LV18549-1	V18549	V18550	270.9	0.014	873.15	869.7	Circular	2.25
LV18549-2	V18549	V18550	270.9	0.015	879.82	876.01	Natural	1
LV18550-1	V18550	V18547	336.8	0.014	869.7	863.11	Circular	2.25
LV18550-2	V18550	V18547	336.8	0.015	876.01	869.4	Natural	1
LV18551-1	V18551	V18549	60.1	0.014	873.99	873.22	Circular	2.25
LV18551-2	V18551	V18549	60.1	0.015	880.38	879.82	Natural	1
LV18570-1	V18570	V19138	633	0.014	849.12	847.44	Circular	6
LV18570-2	V18570	V19138	633	0.015	869.3	871.1	Natural	1
LV18612-1	V18612	V18248	173	0.014	862.74	861.87	Circular	1.5
LV18612-2	V18612	V18248	173	0.015	872	872.5	Natural	1
LV18645-1	V18645	V18570	203	0.014	861.01	860	Circular	1.5
LV18645-2	V18645	V18570	203	0.015	871.5	870.3	Natural	1
LV19138-1	V19138	V19728	660.7	0.014	847.44	846.07	Circular	6
LV19138-2	V19138	V19728	660.7	0.015	871.1	865.5	Natural	1
LV19728-1	V19728	V19898	306.1	0.014	846.07	845.29	Circular	6
LV19728-2	V19728	V19898	306.1	0.015	865.5	854.2	Natural	1
LV19898-1	V19898	V19981	251.81	0.014	837.65	835	Circular	6
LV19898-2	V19898	V19981	251.81	0.015	854.2	845	Natural	1
LV19981	V19981	KINGS PND	79	0.014	825.686	825.5	Circular	6
LV20671-1	V20772	V20617	320	0.014	839.23	836.08	Circular	2.25
LV20671-2	V20772	V20617	320	0.015	846.5	842	Natural	1
LV20772-1	V21246	V20772	304.1	0.014	854.95	839.88	Circular	2
LV20772-2	V21246	V20772	304.1	0.015	865.85	846.5	Natural	1
LV21321-1	V21321	V21246	329	0.014	872.76	859.9	Circular	1.25
LV21321-2	V21321	V21246	329	0.015	878.3	865.85	Natural	1
LV21430-1	V21430	V21246	355.8	0.014	864.52	859.35	Circular	2

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
LV21430-2	V21430	V21246	355.8	0.015	871.42	865.85	Natural	1
LV21913-1	V21913	V21430	290.2	0.014	867.42	864.52	Circular	2
LV21913-2	V21913	V21430	290.2	0.015	873.44	871.42	Natural	1
LV22048-1	V22048	V21913	32.4	0.014	867.65	867.42	Circular	1.5
LV22048-2	V22048	V21913	32.4	0.015	874.06	873.44	Natural	1
LV22050-1	V22050	V22055	20.1	0.014	874.34	873.68	Circular	1.5
LV22050-2	V22050	V22055	20.1	0.015	880.3	879.3	Natural	1
LV22056-1	V22055	V22048	281.7	0.014	873.68	868.07	Circular	1.5
LV22056-2	V22055	V22048	281.7	0.015	879.3	874.06	Natural	1
LV99999-1	V20617	V19981	132	0.014	835.62	835.04	Circular	2.25
LV99999-2	V20617	V19981	132	0.015	842	845	Natural	1
LVWEIR	VWEIR	VOUT	289	0.014	858	857.5	Circular	5
OVFL10	U23733-2	U23733-1	275	0.1	863	862	Natural	0.5
OVFL11	U23733-2	U23733-1	275	0.1	863	862	Natural	0.5
OVFL12	U24966	U24971	150	0.1	876	876	Natural	0.5
OVFL13	U24966	U24971	150	0.1	876	876	Natural	0.5
OVFL14	U24966	U24971	150	0.1	876	876	Natural	0.5
OVFL4	45_PL ALL	U24515	160	0.016	877.5	877.27	Natural	0.5
OVFL5	45_PL ALL	U24515	160	0.016	877.5	877.27	Natural	0.5
OVFL6	U23733-1	44_WE ALL	100	0.016	862	851.3	Natural	0.5
OVFL7	U23733-1	44_WE ALL	100	0.016	862	851.3	Natural	0.5
Prt-24-25.	24-Port	25-Port	684	0.015	865.56	862.3	Natural	1
Prt-27-28.	27-Port	28-Port	655.64	0.015	861.3	859	Natural	1
Prt-28-29.	29-Port	28-Port	688.07	0.015	866.12	859	Natural	1
Pump 1	U23765	U23819	10	0.014	0.05	0	Circular	0.05
RLS-1	R90	R53	0	0	0	0	Circular	0
RLS-2	R90	R53	0	0	0	0	Circular	0
ST \46_PO	46_PO	OAK OUT4	307	0.016	833.3	832.5	Natural	0.5
ST 4_44	4_44	44_4A	163	0.016	836.27	835.8	Natural	0.5
ST 4_PO	43_PO	OAK OUT7	265	0.016	836.5	833.5	Natural	0.5
ST 42_PL	42_PL ALL	T22803	187	0.016	873.75	878.55	Natural	0.25
ST 43_3	43_3	43_CL	354.6	0.016	837.5	838.5	Natural	0.5
ST 43_4	43_4	43_5	370.7	0.016	838.8	837.8	Natural	0.5
ST 43_5	43_5	43_5A	11.3	0.016	837.8	837.8	Natural	0.5
ST 43_CL	43_CL	43_4	329	0.016	838.5	838.5	Natural	0.5
ST 43_PO	43_PO	43_5	248.8	0.016	836.5	837.5	Natural	0.5
ST 44_2	44_2	44_3 MID	179.8	0.016	841.8	839.43	Natural	0.5
ST 44_3	44_3	44_3A	43	0.016	837.5	837.5	Natural	0.5
ST 44_3A	44_3A	44_CL	313.8	0.016	837.8	836.89	Natural	0.5
ST 44_4	44_4	44_4A	40.2	0.016	835.92	835.8	Natural	0.5
ST 44_4A	44_4A	44_5 B	310.4	0.016	835.8	834.8	Natural	0.5
ST 44_5	44_5	44_5A	39.8	0.016	834.8	834.8	Natural	0.5
ST 44_5 B	44_5 B	44_5A	16	0.016	834.8	834.8	Natural	0.5
ST 44_5A	44_5A	45_5	651.1	0.016	834.8	835.8	Natural	0.5

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
ST 44_CL	44_CL	44CL_MID	160.5	0.016	836.89	836.33	Natural	0.5
ST 44_PO	44_PO	44_5A	282	0.016	832.87	834.8	Natural	0.5
ST 44_POA	44_POA	44_PO	68	0.016	832.5	832.87	Natural	0.5
ST 44_WE	44_WE ALL	U23765	43.5	0.016	851.55	854.45	Natural	0.25
ST 44CL_M	44CL_MID	44_4	140.5	0.016	836.33	835.92	Natural	0.5
ST 45_2	45_2	45_3	240	0.016	842.69	837.82	Natural	0.5
ST 45_3	45_3	45_3 A	40	0.016	837.82	836.8	Natural	0.5
ST 45_3A	45_3 A	45_3B	8.5	0.016	836.8	836.8	Natural	0.5
ST 45_3B	45_3B	45_3 C	13	0.016	836.8	836.8	Natural	0.5
ST 45_3C	45_3 C	45_3 MID	149.9	0.016	836.8	836.27	Natural	0.5
ST 45_3M	45_3 MID	45_CL	142.3	0.016	836.27	835.8	Natural	0.5
ST 45_4	45_4	45_5	313.9	0.016	836.8	835.8	Natural	0.5
ST 45_5	45_5	46_5	626.4	0.016	835.8	833.5	Natural	0.5
ST 45_CL	45_CL	45_CL A	31.9	0.016	835.8	835.8	Natural	0.5
ST 45_CLA	45_CL A	45_4	350.1	0.016	835.8	836.8	Natural	0.5
ST 45_PL	45_PL ALL	45_PL ALL2	158.6	0.016	876.25	878.05	Natural	0.25
ST 45_PL2	45_PL ALL2	U24885	14.5	0.016	878.05	878.05	Natural	0.25
ST 45_PO	45_PO	45_5	269	0.016	835.3	835.8	Natural	0.5
ST 46_2A	46_2 A	46_2 MID	126	0.016	841.9	839.3	Natural	0.5
ST 46_2M	46_2 MID	46_MID A	45	0.016	839.3	839.3	Natural	0.5
ST 46_3	46_3	46_3A	77.8	0.016	835.8	835.8	Natural	0.5
ST 46_3A	46_3A	46_CL	281.1	0.016	835.8	833.5	Natural	0.5
ST 46_4	46_4	46_4 A	39	0.016	834.5	834.5	Natural	0.5
ST 46_4A	46_4 A	46_4 B	17	0.016	834.5	834.5	Natural	0.5
ST 46_4B	46_4 B	46_MID	139	0.016	834.5	834	Natural	0.5
ST 46_5	46_5	46_5A	40.7	0.016	833.5	833.5	Natural	0.5
ST 46_5A	46_5A	5_46 MID	409.6	0.016	833.5	835.84	Natural	0.5
ST 46_CL	46_CL	46_CL A	31.5	0.016	833.5	833.5	Natural	0.5
ST 46_CLA	46_CL A	46_4	294.3	0.016	833.5	834.5	Natural	0.5
ST 46_LY	46_LY ALL	U25405	301	0.016	875.25	874.25	Natural	0.25
ST 46_M	46_MID	46_5A	173	0.016	834.5	834	Natural	0.5
ST 46_MA	46_MID A	46_3	83	0.016	839.3	835.8	Natural	0.5
ST 46_PO	46_PO	46_PO A	62	0.016	833.3	833.52	Natural	0.5
ST 46_POA	46_PO A	46_5A	295	0.016	833.5	833.5	Natural	0.5
ST 47_2	47_2	47_3	309.9	0.016	843.8	842.8	Natural	0.5
ST 47_3	47_3	47_CL	350.3	0.016	842.8	841.8	Natural	0.5
ST 47_4	47_4	47_4 A	24	0.016	842.8	842.8	Natural	0.5
ST 47_4A	47_4 A	47_4 B	32	0.016	842.8	842.8	Natural	0.5
ST 47_4B	47_4 B	47_5	328.8	0.016	842.8	836.3	Natural	0.5
ST 47_5	47_5	48_5	650.5	0.016	836.3	831.8	Natural	0.5
ST 47_CL	47_CL	47_CL A	31.3	0.016	841.8	841.8	Natural	0.5
ST 47_CLA	47_CL A	47_4	277.58	0.016	841.8	842.8	Natural	0.5
ST 47_PO	47_PO	47_5	273	0.016	834.41	836.3	Natural	0.5
ST 48_1	48_1	48_ST	290.1	0.016	870.8	857.8	Natural	0.5

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
ST 48_3	48_3	48_CL	332	0.016	853.25	850.42	Natural	0.5
ST 48_4	48_4	48_4 A	93	0.016	840.37	838.76	Natural	0.5
ST 48_4A	48_4 A	48_5	274.5	0.016	838.76	831.8	Natural	0.5
ST 48_5	48_5	49_5	657.2	0.016	831.8	829.5	Natural	0.5
ST 48_5M	48_5 MID	48_5	139.6	0.016	831.38	831.8	Natural	0.5
ST 48_BL	48_BL	48_BL MID	189	0.016	866.8	866.3	Natural	0.5
ST 48_BLM	48_BL MID	48_NI	171.8	0.016	866.3	865.8	Natural	0.5
ST 48_CL	48_CL	48_4	326	0.016	850.42	840.37	Natural	0.5
ST 48_NI	48_NI	48_NIA	85.5	0.016	865.8	865.8	Natural	0.5
ST 48_NIA	48_NIA	48_1	287.2	0.016	865.8	870.8	Natural	0.5
ST 48_PO	48_PO	48_5 MID	123.1	0.016	830.82	831.38	Natural	0.5
ST 48_POA	48_PO A	48_PO	70	0.016	830.8	830.8	Natural	0.5
ST 48_ST	48_ST	ST_RU	365	0.016	857.8	850.8	Natural	1.25
ST 48_WE	48_WE	48_BL	304	0.016	880.3	866.8	Natural	0.5
ST 49_1.1	49_1	49_ST	329.3	0.016	860.8	846.5	Natural	0.5
ST 49_2	49_2	49_2 MID	188.1	0.016	845.8	843.8	Natural	0.5
ST 49_2M	49_2 MID	49_3	130.7	0.016	844.5	843.8	Natural	0.5
ST 49_3	49_3	49_3 A	69.3	0.016	843.8	843.8	Natural	0.5
ST 49_3A	49_3 A	49_CL	278	0.016	843.8	832.5	Natural	0.5
ST 49_4	49_4	49_4 A	31.1	0.016	828.5	828.5	Natural	0.5
ST 49_4A	49_4 A	49_5	332.4	0.016	828.5	829.5	Natural	0.5
ST 49_5	49_5	5_CRK	558.6	0.016	829.5	828.9	Natural	0.5
ST 49_5M	49_5 MID	49_5	144.6	0.016	828.5	829.5	Natural	0.5
ST 49_5MI	49_5 MID	OAK OUT1	186.5	0.016	828.5	827.5	Natural	0.5
ST 49_CL	49_CL	49_4	326.6	0.016	832.5	828.5	Natural	0.5
ST 49_NI	49_NI	49_1	308.8	0.016	886.56	860.8	Natural	0.5
ST 49_PLM.	49_PL MID	49_WE	293	0.016	898.37	897.6	Natural	0.5
ST 49_ST.1	49_ST	49_ST A	26.7	0.016	846.5	846.5	Natural	0.5
ST 49_STB	49_ST B	49_ST A	24	0.016	846.8	846.8	Natural	1.25
ST 49_STC	49_ST C	49_ST B	24	0.016	846.8	846.8	Natural	1.25
ST 49_STE	49_ST E	49_ST A	35	0.016	846.5	846.5	Natural	0.5
ST 49_WE.1	49_WE	49_WE MID	312.1	0.016	897.6	894.8	Natural	0.5
ST 49_WEM	49_WE MID	49_NI	364.4	0.016	894.8	886.56	Natural	0.5
ST 5_43AD	43_5A	44_5	627.2	0.016	837.8	834.8	Natural	0.5
ST 5_46M	5_46 MID	47_5	200.2	0.016	835.84	836.3	Natural	0.5
ST 50_1	50_1	50_ST	291.5	0.016	913.16	889.87	Natural	0.5
ST 50_BE	50_BE	50_NI	305.9	0.016	916.8	903.84	Natural	0.5
ST 50_BEA	50_BE	U27577	861	0.016	916.8	909.5	Natural	0.5
ST 50_NI	50_NI	50_NI A	53	0.016	903.84	901.54	Natural	0.5
ST 50_NIA	50_NI A	49_NI	488	0.016	901.54	886.56	Natural	0.5
ST 50_ST	50_ST	50_ST A	51	0.016	889.87	887.28	Natural	0.5
ST 50_STA	50_ST A	50_ST B	186	0.016	887.28	876.21	Natural	0.5
ST 50_STB	50_ST B	ST_49 F	209	0.016	876.21	861.52	Natural	0.5
ST 51_ST	51_ST	50_ST A	511	0.016	893.01	887.28	Natural	0.5

Table B5 -XPSWMM Proposed Conditions Hydraulic Input Parameters
I-35W Corridor Drainage Study

Link Name	Upstream Node Name	Downstream Node Name	Length (ft)	Roughness	US Invert (ft)	DS Invert (ft)	Shape	Diameter/ Height (ft)
ST BE_50	BE_50	50_BE	43.5	0.016	916.8	916.8	Natural	0.5
ST BE_61	BE_61	BE_50	514.6	0.016	919.8	916.8	Natural	0.5
ST N510	N510	T23544	12	0.016	878.3	878.3	Natural	1
ST NI_RU	NI_RU	48_NI	222	0.016	871.8	865.8	Natural	0.5
ST R53	R53	R58	345	0.016	856.8	839.5	Natural	0.5
ST RU.1	RU	RU_WE	173.2	0.016	890.5	895	Natural	0.5
ST RU_WE	RU_WE	48_WE	382.8	0.016	895	880.3	Natural	0.5
ST ST_49F	ST_49 F	49_ST E	206	0.016	861.52	846.5	Natural	0.5
ST ST_RU	ST_RU	49_ST C	268.4	0.016	850.8	846.8	Natural	1.25
ST WE_RU	WE_RU	RU_WE	91.6	0.016	896.4	895	Natural	0.5
ST43_2	43_2	43_3	288.9	0.016	838.5	837.5	Natural	0.5
ST43_3	43_3	44_3	666	0.016	837.5	837.5	Natural	0.5
ST44_3 ALL	44_3 ALL2	Node386	113.9	0.014	832.8	832.23	Circular	1.25
ST44_3 MID	44_3 MID	44_3	123.1	0.016	839.43	837.5	Natural	0.5
ST44_CL	44_CL	45_CL	664	0.016	836.89	835.8	Natural	0.5
ST44_POA	44_POA	OAK OUT6	323	0.016	832.5	830.5	Natural	0.5
ST45_CL	45_CL	46_CL	655	0.016	835.8	833.5	Natural	0.5
ST48_BL AL	48_BL ALL	48_BL MID	124.3	0.016	864.75	866.55	Natural	0.25
ST48_NI	48_NI	U25895	707	0.016	865.8	865.6	Natural	0.5
ST48_PO	48_PO A	OAK OUT2	332	0.016	830.8	829.5	Natural	0.5
ST49_4	49_4	50_4	648	0.016	828.5	826.5	Natural	0.5
ST49_RU A	49_RU ALL2	49_RU ALL	172	0.016	895.75	900.3	Natural	0.25
Ste-24-25.	24-Stev	25-Stev	655.37	0.015	888.45	883.3	Natural	1
Ste-25-26.	25-Stev	26-Stev	657.01	0.015	883.3	870.3	Natural	1
UPS-1	U23765	U23819	0	0	0	0	Circular	0
upstream	NPondIn	North Pond	45	0.015	848	849	Natural	1
V20617-3	V20617	KINGS PND	100	0.015	842	825.5	Natural	1
VPS-1	KINGS PND	N2075	0	0	0	0	Circular	0
VPS-2	KINGS PND	N2075	0	0	0	0	Natural	0
VPS-3	KINGS PND	N2075	0	0	0	0	Circular	0

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study
HENNC 113114
Date: 7.3.14
[1]2014 Existing Conditions (Atlas 14)
[2]Proposed Conditions Model
[3]Proposed Conditions with Rate Control Structures
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Tables

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
220-0	838.9	839.3	-0.4	838.9	839.4	-0.5	838.9	839.3	-0.4
22-35W	865.9	870.5	-4.6	866.9	869.9	-3.0	866.9	869.3	-2.4
224-0	836.7	836.9	-0.2	836.7	837.3	-0.6	836.7	836.6	0.1
232-0	844.8	845.2	-0.4	844.8	845.2	-0.4	844.8	845.0	-0.2
235-0	850.8	851.2	-0.4	850.8	851.2	-0.4	850.8	851.2	-0.4
2-3AV	861.9	0.0	861.9	861.9	0.0	861.9	861.9	0.0	861.9
2-3Av-2	863.1	0.0	863.1	863.1	0.0	863.1	863.1	0.0	863.1
24/25-35WA	855.9	862.5	-6.6	855.9	855.3	0.7	855.9	850.2	5.7
24/25-35WB	854.9	857.4	-2.5	854.3	855.3	-1.0	854.3	854.0	0.3
24-1st	890.5	891.0	-0.5	890.5	891.0	-0.5	890.5	891.0	-0.5
24-35W_1	863.1	863.5	-0.3	852.4	855.2	-2.8	852.4	853.0	-0.6
24-3rd	887.4	888.0	-0.6	887.4	888.0	-0.6	887.4	888.0	-0.6
24-4th	867.3	868.4	-1.1	867.3	868.4	-1.1	867.3	868.4	-1.1
24-5th	866.6	861.2	5.5	866.6	859.9	6.7	866.6	859.4	7.3
24-Clin	869.3	869.8	-0.5	869.3	869.8	-0.5	869.3	869.8	-0.5
24-Nic	893.3	893.6	-0.3	893.3	893.6	-0.3	893.3	893.6	-0.3
24-Port	865.6	865.9	-0.4	865.6	865.9	-0.4	865.6	865.9	-0.4
24-Port-2	865.4	865.8	-0.4	865.4	865.7	-0.3	865.4	865.7	-0.3
24-Stev	888.5	888.9	-0.5	888.5	888.9	-0.5	888.5	888.9	-0.5
25-1st	882.5	883.3	-0.8	882.5	883.3	-0.8	882.5	883.3	-0.8
25-1st_2	882.4	883.2	-0.8	882.4	883.2	-0.8	882.4	883.2	-0.8
25-35W	856.7	857.4	-0.7	854.3	855.0	-0.8	854.3	854.8	-0.5
25-3rd	875.9	876.9	-1.0	875.9	876.9	-1.0	875.9	876.9	-1.0
25-3rd-2	875.8	876.6	-0.8	875.8	876.6	-0.8	875.8	876.6	-0.8

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
25-4th	871.3	872.1	-0.8	871.3	872.1	-0.8	871.3	872.1	-0.8
25-4th-2	871.3	871.6	-0.3	871.3	871.6	-0.3	871.3	871.6	-0.3
25-5th	861.3	861.8	-0.5	861.3	861.8	-0.5	861.3	861.8	-0.5
25-ArtIn	879.3	879.9	-0.6	879.3	879.9	-0.6	879.3	879.9	-0.6
25-Clin	873.8	874.7	-0.9	873.8	874.7	-0.9	873.8	874.7	-0.9
25-Nic	882.5	883.3	-0.8	882.5	883.3	-0.8	882.5	883.3	-0.8
25-Oak	864.3	864.8	-0.5	864.3	864.8	-0.5	864.3	864.8	-0.5
25-Port	862.3	863.2	-0.9	862.3	863.2	-0.9	862.3	863.2	-0.9
25-Port-2	862.3	863.1	-0.8	862.3	863.1	-0.8	862.3	863.1	-0.8
25-Stev	883.3	882.9	0.4	883.3	882.9	0.4	883.3	882.9	0.4
26-1st	871.3	871.9	-0.6	871.3	871.9	-0.6	871.3	871.9	-0.6
26-35W	854.0	853.3	0.8	852.7	851.3	1.3	852.7	848.8	3.9
26-Bla	871.8	872.4	-0.6	871.8	872.4	-0.6	871.8	872.4	-0.6
26-Nic	872.3	872.7	-0.4	872.3	872.7	-0.4	872.3	872.7	-0.4
26-Nic-2	872.3	872.6	-0.3	872.3	872.6	-0.3	872.3	872.6	-0.3
26-Stev	870.3	870.9	-0.6	870.3	870.9	-0.6	870.3	870.9	-0.6
27-1st	867.4	868.5	-1.1	867.4	868.5	-1.1	867.4	868.5	-1.1
27-2nd	865.5	868.4	-2.9	865.5	868.4	-2.9	865.5	868.4	-2.9
27-2nd-2	865.3	868.4	-3.1	865.3	868.5	-3.2	865.3	868.4	-3.1
27-35W	850.9	841.1	9.8	851.4	840.6	10.7	851.4	840.3	11.1
27-3rd	864.3	868.5	-4.2	864.3	868.5	-4.2	864.3	868.5	-4.2
27-4th	859.3	855.0	4.3	859.3	855.0	4.3	859.3	855.0	4.3
27-5th	857.3	858.4	-1.1	857.3	858.4	-1.1	857.3	858.4	-1.1
27-5th-2	857.8	858.4	-0.6	857.8	858.4	-0.6	857.8	858.4	-0.6
27-Bla	870.7	871.1	-0.5	870.7	871.1	-0.5	870.7	871.1	-0.5
27-Bla-2	870.1	871.0	-0.9	870.1	871.0	-0.9	870.1	871.0	-0.9
27-Clint	864.2	868.5	-4.3	864.2	868.5	-4.3	864.2	868.5	-4.3
27-Clint-2	864.3	861.1	3.2	864.3	861.1	3.2	864.3	860.7	3.6
27-Colum	864.3	864.6	-0.3	864.3	864.6	-0.3	864.3	864.6	-0.3
27-Nic	869.0	870.1	-1.1	869.0	870.1	-1.1	869.0	870.1	-1.1
27-Nic-2	868.9	869.8	-0.8	868.9	869.8	-0.8	868.9	869.8	-0.8
27-Oak	864.3	864.3	0.0	864.3	864.3	0.0	864.3	864.3	0.0
27-Park	863.3	864.4	-1.1	863.3	864.4	-1.1	863.3	864.4	-1.1
27-Park-2	863.4	864.4	-1.0	863.4	864.4	-1.0	863.4	864.4	-1.0
27-Pils	872.3	872.8	-0.5	872.3	872.8	-0.5	872.3	872.8	-0.5
27-Port	861.3	861.7	-0.4	861.3	861.7	-0.4	861.3	861.7	-0.4
27-Port-2	861.3	861.7	-0.4	861.3	861.7	-0.4	861.3	861.7	-0.4
27-Stev	866.4	868.4	-2.0	866.4	868.4	-2.0	866.4	868.4	-1.9
27-Stev-2	866.9	868.4	-1.5	866.9	868.4	-1.5	866.9	868.3	-1.4
28-1st	869.8	870.5	-0.7	869.8	870.5	-0.7	869.8	870.5	-0.7

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
28-1st-2	869.9	870.6	-0.7	869.9	870.6	-0.7	869.9	870.6	-0.7
28-35W	859.9	860.3	-0.4	856.0	856.4	-0.4	856.0	856.4	-0.5
28-4th	849.1	851.7	-2.7	849.1	851.7	-2.6	849.1	851.7	-2.7
28-5th	849.3	851.7	-2.4	849.3	851.7	-2.4	849.3	851.7	-2.4
28-5th-2	848.3	851.7	-3.4	848.3	851.7	-3.4	848.3	851.7	-3.4
28-Bla	872.3	872.8	-0.5	872.3	872.8	-0.5	872.3	872.8	-0.5
28-Clin	861.4	855.5	5.9	861.4	855.5	6.0	861.4	855.4	6.0
28-Colum	866.0	866.6	-0.6	866.0	866.6	-0.6	866.0	866.6	-0.6
28-Nic	871.3	872.0	-0.7	871.3	872.0	-0.7	871.3	872.0	-0.7
28-Nic-2	871.4	872.0	-0.6	871.4	872.0	-0.6	871.4	872.0	-0.6
28-Oak	863.5	864.1	-0.6	863.5	864.1	-0.6	863.5	864.1	-0.6
28-Park	865.2	865.8	-0.6	865.2	865.8	-0.6	865.2	865.8	-0.6
28-Park-2	865.3	865.9	-0.6	865.3	865.9	-0.6	865.3	865.9	-0.6
28-Port	859.0	859.6	-0.6	859.0	859.6	-0.6	859.0	859.6	-0.6
28-Port-2	859.6	860.3	-0.7	859.6	860.3	-0.7	859.6	860.3	-0.7
28-Stev	868.3	869.2	-0.9	868.3	869.2	-0.9	868.3	869.2	-0.9
28-Stev-2	868.4	869.3	-0.9	868.4	869.3	-0.9	868.4	869.3	-0.9
29-2nd	867.8	868.0	-0.2	867.8	868.0	-0.2	867.8	868.0	-0.2
29-35W	872.0	872.3	-0.3	871.7	872.0	-0.3	871.7	872.0	-0.3
29-3rd	867.3	867.6	-0.3	867.3	867.6	-0.3	867.3	867.5	-0.2
29-4th	850.3	851.8	-1.5	850.3	851.7	-1.4	850.3	851.8	-1.5
29-5th	847.8	851.7	-3.9	847.8	851.7	-3.9	847.8	851.7	-3.9
29-5th-2	848.1	851.7	-3.6	848.1	851.7	-3.6	848.1	851.7	-3.6
29-5th-3	848.1	851.7	-3.6	848.1	851.7	-3.6	848.1	851.7	-3.6
29-Bla	873.3	873.8	-0.5	873.3	873.8	-0.5	873.3	873.8	-0.5
29-BouAdd	865.7	867.6	-1.9	865.7	867.6	-1.8	865.7	867.5	-1.8
29-Clin	868.3	861.6	6.8	868.3	861.6	6.8	868.3	861.5	6.8
29-Dues	866.0	867.1	-1.1	866.0	867.0	-1.0	866.0	867.0	-1.0
29-HncAdd	849.1	851.8	-2.7	849.1	851.7	-2.6	849.1	851.7	-2.6
29-Nic	872.0	872.6	-0.5	872.0	872.6	-0.5	872.0	872.6	-0.5
29-Nic-2	872.1	872.6	-0.5	872.1	872.6	-0.5	872.1	872.6	-0.5
29-Pils	875.0	875.3	-0.2	875.0	875.3	-0.2	875.0	875.3	-0.2
29-pils-2	875.0	875.3	-0.3	875.0	875.3	-0.3	875.0	875.3	-0.3
29-Pleas	876.1	876.3	-0.2	876.1	876.3	-0.2	876.1	876.3	-0.2
29-Port	866.1	866.3	-0.2	866.1	866.3	-0.2	866.1	866.3	-0.2
2Av-Clin	858.8	860.5	-1.6	858.8	860.5	-1.6	858.8	860.3	-1.5
2Av-Clin-3	859.4	0.0	859.4	859.4	0.0	859.4	859.4	0.0	859.4
35TH_C	840.9	841.4	-0.5	840.9	841.4	-0.5	840.9	841.4	-0.5
35TH_D	843.3	843.5	-0.2	843.3	843.5	-0.2	843.3	843.5	-0.2
4_44	836.3	836.6	-0.3	836.3	836.6	-0.3	836.3	836.6	-0.3

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
40TH	834.5	838.4	-3.9	832.2	838.4	-6.2	832.2	838.4	-6.2
42_HA	881.7	881.4	0.3	881.7	881.4	0.3	881.7	881.4	0.3
42_PL ALL	874.0	877.3	-3.3	874.0	877.3	-3.3	874.0	877.3	-3.3
42ND	821.7	832.9	-11.2	822.0	832.9	-10.9	822.0	832.7	-10.7
43_2	839.0	838.8	0.2	839.0	838.8	0.2	839.0	838.8	0.2
43_3	838.0	838.5	-0.5	838.0	838.5	-0.5	838.0	838.5	-0.5
43_4	839.0	838.8	0.2	839.0	838.8	0.2	839.0	838.8	0.2
43_5	838.0	837.4	0.6	838.0	837.5	0.5	838.0	837.4	0.6
43_5A	838.0	837.4	0.6	838.0	837.4	0.6	838.0	837.4	0.6
43_CL	839.0	838.7	0.3	839.0	838.7	0.3	839.0	838.7	0.3
43_PO	837.0	836.9	0.1	837.0	836.9	0.1	837.0	836.9	0.1
43RD_ORIF	826.7	832.6	-5.9	826.7	832.9	-6.2	826.7	832.6	-5.9
43RD-2	824.7	832.5	-7.8	824.7	832.7	-8.1	824.7	832.5	-7.8
43RD-3	824.7	832.5	-7.8	824.7	832.4	-7.7	824.7	832.4	-7.8
44_2	842.3	839.2	3.1	842.3	839.2	3.1	842.3	839.2	3.1
44_3	838.0	838.4	-0.4	838.0	838.4	-0.4	838.0	838.4	-0.4
44_3 ALL1	839.8	840.0	-0.2	839.8	840.0	-0.2	839.8	840.0	-0.2
44_3 ALL2	837.5	837.1	0.4	837.5	837.1	0.4	837.5	837.1	0.4
44_3 MID	839.9	838.8	1.2	839.9	838.8	1.2	839.9	838.8	1.2
44_3A	838.0	838.4	-0.4	838.0	838.4	-0.4	838.0	838.4	-0.4
44_4	836.4	836.5	-0.1	836.4	836.5	-0.1	836.4	836.5	-0.1
44_4A	836.3	836.4	-0.1	836.3	836.4	-0.1	836.3	836.4	-0.1
44_5	835.3	835.4	-0.2	835.0	835.4	-0.4	835.0	835.4	-0.4
44_5 B	835.3	835.5	-0.2	835.0	835.5	-0.5	835.0	835.5	-0.5
44_5A	835.3	835.4	-0.2	835.0	835.4	-0.4	835.0	835.4	-0.4
44_BL ALL	851.0	846.3	4.7	851.0	846.3	4.7	851.0	846.3	4.7
44_BL ALL2	854.3	845.3	9.0	854.3	845.3	9.0	854.3	845.3	9.0
44_BL ALL3	854.0	841.4	12.6	854.0	841.4	12.6	854.0	841.4	12.6
44_CL	837.4	837.4	0.0	837.4	837.4	0.0	837.4	837.4	0.0
44_CL ALL	835.0	836.4	-1.4	835.0	836.4	-1.4	835.0	836.4	-1.4
44_PO	833.9	833.7	0.2	833.6	833.7	0.0	833.6	833.7	0.0
44_POA	833.5	833.3	0.2	833.5	833.3	0.2	833.5	833.3	0.2
44_WE ALL	851.6	858.8	-7.3	851.3	858.8	-7.5	851.3	858.8	-7.5
44_WE ALL3	859.0	859.4	-0.4	859.0	859.4	-0.4	859.0	859.4	-0.4
44CL_MID	836.8	836.8	0.0	836.8	836.8	0.0	836.8	836.8	0.0
44TH_ORIF	853.9	835.6	18.3	853.9	836.0	17.9	853.9	835.6	18.3
45_2	842.7	837.3	5.4	842.7	837.3	5.4	842.7	837.3	5.4
45_3	837.8	837.0	0.8	837.8	837.8	0.0	837.8	837.2	0.7
45_3 A	836.8	836.8	0.0	836.8	836.9	-0.1	836.8	836.8	0.0
45_3 ALL	835.8	836.5	-0.7	835.8	836.5	-0.7	835.8	836.5	-0.7

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
45_3 C	836.8	836.8	0.0	836.8	836.9	-0.1	836.8	836.8	0.0
45_3 MID	836.3	836.5	-0.2	836.3	836.5	-0.2	836.3	836.5	-0.2
45_3B	836.8	836.8	0.0	836.8	836.9	-0.1	836.8	836.8	0.0
45_4	837.3	836.0	1.3	837.3	836.0	1.3	837.3	836.0	1.3
45_5	836.3	835.2	1.1	836.3	835.2	1.1	836.3	835.2	1.1
45_CL	836.3	836.3	0.0	836.3	836.3	0.0	836.3	836.3	0.0
45_CL A	836.3	836.3	0.0	836.3	836.3	0.0	836.3	836.3	0.0
45_PL ALL	877.8	877.8	-0.1	877.5	877.8	-0.3	877.5	877.8	-0.3
45_PL ALL2	878.1	877.8	0.2	878.1	877.8	0.2	878.1	877.8	0.2
45_PO	835.3	835.5	-0.2	835.3	835.5	-0.2	835.3	835.5	-0.2
45TH_ORIF	853.4	842.0	11.4	853.4	842.0	11.4	853.4	842.0	11.4
46_2 A	841.9	836.9	5.0	841.9	836.9	5.0	841.9	836.9	5.0
46_2 ALL	836.5	837.0	-0.5	836.5	837.0	-0.5	836.5	837.0	-0.5
46_2 ALL1	836.5	837.0	-0.5	836.5	837.0	-0.5	836.5	837.0	-0.5
46_2 MID	839.3	836.6	2.7	839.3	836.6	2.7	839.3	836.6	2.7
46_3	836.3	836.4	-0.1	836.3	836.4	-0.1	836.3	836.4	-0.1
46_3A	836.3	836.3	0.0	836.3	836.3	0.0	836.3	836.3	0.0
46_3B	836.5	836.9	-0.4	836.5	836.9	-0.4	836.5	836.9	-0.4
46_3C	836.5	836.9	-0.4	836.5	836.9	-0.4	836.5	836.9	-0.4
46_4	835.0	835.2	-0.2	835.0	835.2	-0.2	835.0	835.2	-0.2
46_4 A	835.0	835.1	-0.1	835.0	835.1	-0.1	835.0	835.1	-0.1
46_4 ALL	832.0	833.9	-1.9	832.0	833.9	-1.9	832.0	833.9	-1.9
46_4 B	835.0	835.1	-0.1	835.0	835.1	-0.1	835.0	835.1	-0.1
46_5	834.0	834.5	-0.5	834.0	834.5	-0.5	834.0	834.5	-0.5
46_5A	834.0	834.5	-0.5	834.0	834.5	-0.5	834.0	834.5	-0.5
46_CL	834.0	835.3	-1.3	834.0	835.3	-1.3	834.0	835.3	-1.3
46_CL A	834.0	835.3	-1.3	834.0	835.3	-1.3	834.0	835.3	-1.3
46_GA ALL	873.8	875.8	-2.0	873.8	875.8	-2.0	873.8	875.8	-2.0
46_LY ALL	875.3	875.6	-0.3	875.3	875.6	-0.3	875.3	875.6	-0.3
46_MID	834.5	834.9	-0.4	834.5	834.9	-0.4	834.5	834.9	-0.4
46_MID A	839.3	836.6	2.7	839.3	836.6	2.7	839.3	836.6	2.7
46_MID B	839.8	836.6	3.2	839.8	836.6	3.2	839.8	836.6	3.2
46_PO	834.3	834.1	0.2	834.3	834.1	0.2	834.3	834.1	0.2
46_PO A	834.0	834.2	-0.2	834.0	834.2	-0.2	834.0	834.2	-0.2
46TH-1	831.1	833.1	-1.9	831.1	833.3	-2.2	831.1	833.0	-1.9
46TH-10	847.6	848.1	-0.5	847.6	848.1	-0.5	847.6	848.1	-0.5
46TH-11	848.7	849.2	-0.5	848.7	849.2	-0.5	848.7	849.2	-0.5
46TH-12	849.8	850.2	-0.4	849.8	850.2	-0.4	849.8	850.2	-0.4
46TH-13	851.5	851.9	-0.4	851.5	851.9	-0.4	851.5	851.9	-0.4
46TH-14	854.5	854.8	-0.3	854.5	854.8	-0.3	854.5	854.8	-0.3

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
46TH-15	878.0	861.7	16.3	878.0	861.7	16.3	878.0	861.7	16.3
46TH-2	828.9	833.1	-4.1	828.9	833.3	-4.3	828.9	833.0	-4.1
46TH-3	829.1	833.1	-3.9	829.1	833.3	-4.2	829.1	833.0	-3.9
46TH-4	830.4	833.1	-2.6	830.4	833.3	-2.8	830.4	833.0	-2.6
46TH-5	833.1	833.3	-0.2	833.1	833.3	-0.2	833.1	833.3	-0.2
46TH-6	840.4	837.0	3.4	840.4	837.0	3.3	840.4	837.0	3.4
46TH-7	842.1	839.8	2.2	842.1	839.9	2.2	842.1	839.8	2.2
46TH-8	844.6	845.2	-0.6	844.6	845.2	-0.6	844.6	845.2	-0.6
46TH-9	846.4	846.9	-0.6	846.4	846.9	-0.6	846.4	846.9	-0.6
47_2	843.8	843.1	0.7	843.8	843.1	0.7	843.8	843.1	0.7
47_3	842.8	843.0	-0.2	842.8	843.0	-0.2	842.8	843.0	-0.2
47_4	842.8	838.8	4.0	842.8	838.6	4.2	842.8	838.6	4.2
47_4 A	842.8	838.4	4.4	842.8	838.3	4.5	842.8	838.3	4.5
47_4 B	842.8	838.0	4.8	842.8	838.0	4.8	842.8	838.0	4.8
47_5	836.3	834.2	2.1	836.3	834.2	2.1	836.3	834.2	2.1
47_CL	841.8	842.0	-0.2	841.8	842.0	-0.2	841.8	842.0	-0.2
47_CL A	841.8	841.8	0.0	841.8	841.8	0.0	841.8	841.8	0.0
47_LY ALL	875.5	875.6	-0.1	875.5	875.6	-0.1	875.5	875.6	-0.1
47_PO	834.4	834.6	-0.2	834.4	834.6	-0.2	834.4	834.6	-0.2
47TH_ORIF	859.2	859.5	-0.3	859.2	859.5	-0.3	859.2	859.5	-0.3
48_1	871.3	863.0	8.3	871.3	863.0	8.3	871.3	863.0	8.3
48_3	853.3	853.4	-0.2	853.3	853.4	-0.2	853.3	853.4	-0.2
48_4	840.4	840.7	-0.4	840.4	840.7	-0.4	840.4	840.7	-0.4
48_4 A	838.8	839.1	-0.3	838.8	839.1	-0.3	838.8	839.1	-0.3
48_5	832.3	832.2	0.1	832.3	832.2	0.1	832.3	832.2	0.1
48_5 ALL	831.0	832.2	-1.2	831.0	832.2	-1.2	831.0	832.2	-1.2
48_5 MID	831.9	831.8	0.1	831.9	831.8	0.1	831.9	831.8	0.1
48_BL	867.3	867.3	0.0	867.3	867.3	0.0	867.3	867.3	0.0
48_BL ALL	864.8	867.2	-2.4	864.8	867.2	-2.4	864.8	867.2	-2.4
48_BL ALL2	866.8	867.2	-0.4	866.8	867.2	-0.4	866.8	867.2	-0.4
48_BL MID	866.8	867.2	-0.4	866.8	867.2	-0.4	866.8	867.2	-0.4
48_CL	850.4	850.6	-0.2	850.4	850.6	-0.2	850.4	850.6	-0.2
48_NI	866.3	867.1	-0.8	866.3	867.1	-0.8	866.3	867.1	-0.8
48_NIA	866.3	867.1	-0.8	866.3	867.1	-0.8	866.3	867.1	-0.8
48_PO	831.3	831.4	-0.1	831.3	831.4	-0.1	831.3	831.4	-0.1
48_PO A	831.3	831.3	0.0	831.3	831.3	0.0	831.3	831.3	0.0
48_ST	858.6	858.8	-0.2	857.8	858.8	-1.0	857.8	858.8	-1.0
48_WE	880.8	880.5	0.3	880.8	880.5	0.3	880.8	880.5	0.3
49_1	861.6	861.4	0.2	861.3	861.4	-0.1	861.3	861.4	-0.1
49_2	846.3	846.2	0.1	846.3	846.2	0.1	846.3	846.2	0.1

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
49_2 ALL	844.5	847.0	-2.6	844.5	847.0	-2.6	844.5	847.0	-2.6
49_2 MID	845.0	845.0	0.0	845.0	845.0	0.0	845.0	845.0	0.0
49_3	844.3	844.2	0.1	844.3	844.2	0.1	844.3	844.2	0.1
49_3 A	844.3	842.5	1.8	844.3	842.5	1.8	844.3	842.5	1.8
49_4	829.3	829.4	-0.1	829.0	829.4	-0.4	829.0	829.4	-0.4
49_4 A	829.3	829.4	-0.1	829.0	829.4	-0.4	829.0	829.4	-0.4
49_5	830.3	829.6	0.6	830.0	829.6	0.4	830.0	829.7	0.3
49_5 ALL	829.0	830.7	-1.7	829.0	830.7	-1.7	829.0	830.7	-1.7
49_5 MID	829.3	828.7	0.6	829.0	828.7	0.3	829.0	828.7	0.3
49_CL	833.3	833.0	0.3	833.0	833.0	0.0	833.0	833.0	0.0
49_NI	887.1	887.0	0.0	887.1	887.0	0.0	887.1	887.0	0.0
49_PL MID	898.4	898.2	0.2	898.4	898.1	0.2	898.4	898.1	0.2
49_RU ALL	900.1	900.1	0.0	900.1	900.1	0.0	900.1	900.1	0.0
49_RU ALL1	900.6	0.0	900.6	900.6	0.0	900.6	900.6	0.0	900.6
49_RU ALL2	895.5	895.7	-0.2	895.5	895.7	-0.2	895.5	895.7	-0.2
49_ST	847.3	854.7	-7.5	847.0	854.8	-7.8	847.0	854.7	-7.7
49_ST A	850.5	854.7	-4.2	849.8	854.8	-5.0	849.8	854.7	-5.0
49_ST B	846.8	854.7	-7.9	846.8	854.8	-8.0	846.8	854.7	-7.9
49_ST C	846.8	854.7	-7.9	846.8	854.8	-8.0	846.8	854.7	-7.9
49_ST E	847.3	854.7	-7.5	847.0	854.8	-7.8	847.0	854.7	-7.7
49_WE	897.6	898.0	-0.4	897.6	898.0	-0.4	897.6	898.0	-0.4
49_WE MID	894.8	895.1	-0.3	894.8	895.1	-0.3	894.8	895.1	-0.3
49TH_DI	849.0	853.9	-4.9	849.0	853.9	-4.9	849.0	853.9	-4.9
49TH_ORIF	849.0	853.3	-4.3	849.0	853.3	-4.3	849.0	853.3	-4.3
5_43 ALL	837.0	838.1	-1.1	837.0	838.1	-1.1	837.0	838.1	-1.1
5_43 ALL2	838.1	837.7	0.4	838.1	837.7	0.4	838.1	837.7	0.4
5_46 ALL	832.0	834.4	-2.4	832.0	834.4	-2.4	832.0	834.4	-2.4
5_46 MID	835.8	834.3	1.6	835.8	834.3	1.5	835.8	834.2	1.6
5_CRK	829.4	827.6	1.8	829.4	827.6	1.8	829.4	827.6	1.8
50_1	913.2	908.7	4.5	913.2	908.7	4.5	913.2	908.7	4.5
50_4	826.5	827.3	-0.8	826.5	827.3	-0.8	826.5	827.3	-0.8
50_BE	917.3	917.0	0.3	917.3	917.0	0.3	917.3	917.0	0.3
50_NI	904.3	904.1	0.2	904.3	904.1	0.2	904.3	904.1	0.2
50_NI A	902.0	901.9	0.1	902.0	901.9	0.1	902.0	901.9	0.1
50_ST	889.9	888.8	1.1	889.9	889.9	0.0	889.9	888.9	1.0
50_ST A	887.3	887.5	-0.2	887.3	887.5	-0.2	887.3	887.5	-0.2
50_ST B	876.2	876.4	-0.2	876.2	876.4	-0.2	876.2	876.4	-0.2
51_ST	893.0	893.2	-0.2	893.0	893.2	-0.2	893.0	893.2	-0.2
7009A	825.3	822.9	2.4	825.3	822.9	2.4	825.3	822.9	2.4
B5339	845.3	845.8	-0.6	845.3	845.8	-0.6	845.3	845.8	-0.6

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
B5352	844.2	844.7	-0.6	844.2	844.7	-0.6	844.2	844.7	-0.6
B5353	843.5	844.0	-0.5	843.5	844.0	-0.5	843.5	844.0	-0.5
B5358	842.9	843.4	-0.5	842.9	843.4	-0.5	842.9	843.4	-0.5
B5359	842.6	842.9	-0.3	842.6	842.9	-0.3	842.6	842.9	-0.3
B5360	842.6	841.4	1.2	842.6	841.4	1.2	842.6	841.4	1.2
B5401	844.4	845.0	-0.6	844.4	845.0	-0.6	844.4	845.0	-0.6
B5407	837.2	835.1	2.0	837.2	835.2	2.0	837.2	835.1	2.0
B5417	828.8	833.1	-4.2	828.8	833.3	-4.4	828.8	833.0	-4.2
B5439	828.8	833.1	-4.2	828.8	833.3	-4.4	828.8	833.0	-4.2
B5472	829.1	833.1	-3.9	829.1	833.3	-4.1	829.1	833.0	-3.9
B5474	829.3	833.1	-3.7	829.3	833.3	-4.0	829.3	833.0	-3.7
B5496	832.5	832.5	0.0	832.5	832.2	0.3	832.5	832.0	0.6
B5501	830.2	832.0	-1.7	830.2	832.2	-2.0	830.2	832.0	-1.7
B5551	857.9	859.7	-1.9	857.9	859.7	-1.8	857.9	859.7	-1.9
B5552	855.0	855.1	0.0	855.0	855.1	0.0	855.0	855.1	0.0
B5553	851.9	850.4	1.5	851.9	850.4	1.5	851.9	850.4	1.5
B5554	849.7	845.6	4.1	849.7	845.6	4.1	849.7	845.6	4.1
B5555	848.2	836.2	12.0	848.2	836.4	11.7	848.2	836.2	12.0
B5557	848.0	835.6	12.4	848.0	836.0	12.0	848.0	835.6	12.4
B5558	844.6	835.1	9.5	844.6	835.6	9.1	844.6	835.1	9.5
B5561	839.8	834.7	5.1	839.8	835.1	4.6	839.8	834.7	5.1
B5564	829.7	833.4	-3.7	829.7	833.6	-3.9	829.7	833.4	-3.7
B5565	829.3	833.1	-3.8	829.3	833.3	-4.0	829.3	833.0	-3.8
B5569	831.1	833.0	-2.0	831.1	833.2	-2.2	831.1	833.0	-1.9
B5571	833.2	832.7	0.5	833.2	833.0	0.2	833.2	832.7	0.5
B5573	826.2	832.5	-6.3	826.2	832.8	-6.6	826.2	832.5	-6.3
BE_50	917.3	917.4	-0.1	917.3	917.4	-0.1	917.3	917.4	-0.1
BE_61	920.3	920.1	0.2	920.3	920.1	0.2	920.3	920.1	0.2
C5400	845.5	846.1	-0.6	845.5	846.1	-0.6	845.5	846.1	-0.6
C5402	843.7	844.3	-0.6	843.7	844.3	-0.6	843.7	844.3	-0.6
C5403	842.6	843.2	-0.6	842.6	843.2	-0.6	842.6	843.2	-0.6
C5427	827.4	832.0	-4.6	827.4	832.2	-4.8	827.4	832.0	-4.6
C5428	827.3	832.0	-4.7	827.3	832.2	-4.9	827.3	832.0	-4.7
C5429	825.8	832.0	-6.2	825.8	832.2	-6.4	825.8	832.0	-6.1
C5430	826.5	832.1	-5.6	826.5	832.4	-5.9	826.5	832.1	-5.6
CB NB 49-2	834.3	825.3	9.0	834.3	825.1	9.2	834.3	825.1	9.2
CB NB 52-2	832.5	828.4	4.1	832.5	828.4	4.2	832.5	828.3	4.2
CB NB 55-2	831.0	830.9	0.1	831.0	831.0	0.1	831.0	830.9	0.1
CB NB 58-4	830.9	831.2	-0.3	830.9	831.2	-0.3	830.9	831.2	-0.3
CB NB 60-2	830.7	831.4	-0.6	830.7	831.4	-0.6	830.7	831.4	-0.6

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
CB78	865.8	860.9	4.9	852.7	855.2	-2.5	852.7	853.1	-0.4
CBLN78-1	830.2	827.3	3.0	830.2	827.2	3.0	830.2	827.2	3.0
CBLN89-1	840.7	832.0	8.8	840.7	832.1	8.6	840.7	832.0	8.8
CBWB 236-2	826.3	826.5	-0.2	826.3	826.5	-0.2	826.3	826.5	-0.2
CBWB 238-2	821.1	823.2	-2.0	821.1	823.1	-2.0	821.1	823.1	-2.0
CBWB 239-2	821.0	823.1	-2.2	821.0	823.1	-2.1	821.0	823.1	-2.2
CBWB 239-4	821.2	823.1	-1.9	821.2	823.1	-1.9	821.2	823.1	-1.9
D6172	848.0	849.5	-1.6	848.0	849.5	-1.6	848.0	849.5	-1.6
D6504	848.8	849.5	-0.7	848.8	849.5	-0.7	848.8	849.5	-0.7
D6572	849.3	849.5	-0.2	849.3	849.5	-0.2	849.3	849.5	-0.2
D6591	845.6	845.7	-0.2	845.6	845.8	-0.2	845.6	845.7	-0.2
D6616	844.5	845.7	-1.3	844.5	845.8	-1.3	844.5	845.7	-1.3
D6667	851.3	851.4	-0.1	851.3	851.4	-0.1	851.3	851.4	-0.1
D6706	839.6	841.4	-1.9	839.6	841.4	-1.9	839.6	841.4	-1.9
D6708	848.1	848.4	-0.3	848.1	848.4	-0.3	848.1	848.4	-0.3
D6720	846.7	846.8	0.0	846.7	846.9	-0.2	846.7	846.8	-0.1
D6761	840.5	841.4	-1.0	840.5	841.4	-1.0	840.5	841.4	-1.0
D6774	847.3	847.2	0.1	847.3	847.2	0.1	847.3	847.2	0.1
D6776	846.8	845.8	1.0	846.8	845.8	1.0	846.8	845.8	1.0
D6780	853.2	853.3	-0.1	853.2	853.3	-0.1	853.2	853.3	-0.1
D6813	839.8	841.4	-1.6	839.8	841.4	-1.6	839.8	841.4	-1.6
D6818	846.6	845.2	1.3	846.6	845.2	1.3	846.6	845.2	1.3
D6844	846.8	845.3	1.5	846.8	845.3	1.5	846.8	845.3	1.5
D6846	839.8	841.4	-1.6	839.8	841.4	-1.6	839.8	841.4	-1.6
D6847	840.3	838.9	1.4	840.3	838.8	1.5	840.3	838.8	1.5
D6852	839.3	840.0	-0.7	839.3	840.0	-0.7	839.3	840.0	-0.7
D6853	839.3	839.8	-0.5	839.3	839.8	-0.5	839.3	839.8	-0.5
D6865	841.3	841.1	0.2	841.3	841.1	0.2	841.3	841.1	0.2
D6894	839.8	840.3	-0.5	839.8	840.3	-0.5	839.8	840.3	-0.5
D6948	839.8	840.1	-0.3	839.8	840.1	-0.3	839.8	840.1	-0.3
D6953	840.3	838.3	2.0	840.3	838.2	2.1	840.3	838.3	2.0
D7121	841.3	837.3	4.0	841.3	837.3	4.0	841.3	837.3	4.0
D7150	842.5	843.0	-0.5	842.5	843.0	-0.5	842.5	843.0	-0.5
D7163	843.3	843.6	-0.3	843.3	843.6	-0.3	843.3	843.6	-0.3
D7165	844.3	844.8	-0.5	844.3	844.8	-0.5	844.3	844.8	-0.5
D7170	841.6	837.3	4.2	841.6	837.3	4.2	841.6	837.3	4.2
D7176	841.8	836.0	5.8	841.8	836.0	5.8	841.8	836.0	5.8
D7181	842.6	843.2	-0.6	842.6	843.2	-0.6	842.6	843.2	-0.6
D7185	844.2	844.5	-0.4	844.2	844.5	-0.4	844.2	844.5	-0.4
D7264	844.7	845.1	-0.4	844.7	845.1	-0.4	844.7	845.1	-0.4

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
D7436	840.8	833.7	7.1	840.8	833.7	7.1	840.8	833.7	7.1
D7476	840.8	832.0	8.8	840.8	832.0	8.8	840.8	832.0	8.8
D7521	840.8	830.5	10.3	840.8	830.4	10.4	840.8	830.4	10.4
D7539	843.6	843.7	-0.2	843.6	843.7	-0.2	843.6	843.7	-0.2
D7552	846.3	846.7	-0.4	846.3	846.7	-0.4	846.3	846.7	-0.4
D7588	840.8	828.9	11.9	840.8	828.9	11.9	840.8	828.9	11.9
D7746	844.6	844.8	-0.2	844.6	844.8	-0.2	844.6	844.8	-0.2
D7886	848.3	848.5	-0.2	848.3	848.5	-0.2	848.3	848.5	-0.2
DS1(39th)	838.1	838.6	-0.5	838.1	838.6	-0.5	838.1	838.6	-0.5
DS12	856.9	826.9	30.0	856.9	826.8	30.1	856.9	826.8	30.1
DS13	853.7	826.5	27.2	853.7	826.5	27.2	853.7	826.5	27.2
DS14	856.5	823.0	33.5	856.5	822.8	33.7	856.5	822.8	33.7
DS15	845.0	821.7	23.3	845.0	821.4	23.6	845.0	821.5	23.5
DS16	810.9	820.6	-9.7	810.9	820.3	-9.5	810.9	820.5	-9.6
DS2(35th)	840.1	840.6	-0.5	840.1	840.5	-0.4	840.1	840.4	-0.3
DS3(31ST)	864.5	840.5	24.0	864.7	840.4	24.2	864.7	840.2	24.4
DS4(27TH)	859.0	837.9	21.1	859.0	837.6	21.4	859.0	837.5	21.5
DS6	840.9	804.6	36.3	840.9	804.5	36.4	840.9	804.7	36.2
DS7	832.7	791.2	41.5	832.7	791.1	41.6	832.7	791.2	41.5
DS8	798.3	780.2	18.1	798.3	780.1	18.2	798.3	780.2	18.1
DS9	815.5	757.6	57.9	815.5	757.6	57.9	815.5	757.6	57.9
G7878	856.3	857.2	-0.9	856.3	857.2	-0.9	856.3	857.2	-0.9
G7893	857.3	857.3	0.0	857.3	857.0	0.3	857.3	857.0	0.3
G7903	856.3	856.7	-0.4	856.3	856.7	-0.4	856.3	856.7	-0.4
G7922	856.3	857.2	-0.9	856.3	857.2	-0.9	856.3	857.2	-0.9
G7944	855.8	857.2	-1.4	855.8	857.2	-1.4	855.8	857.2	-1.4
G7955	856.3	856.6	-0.3	856.3	856.6	-0.3	856.3	856.6	-0.3
G7985	855.3	856.4	-1.1	855.3	856.4	-1.1	855.3	856.4	-1.1
G8163	855.3	853.9	1.4	855.3	853.9	1.4	855.3	853.9	1.4
G8248	857.8	857.5	0.3	857.8	857.5	0.3	857.8	857.5	0.3
G8250	857.8	845.0	12.8	857.8	845.0	12.8	857.8	845.0	12.8
G8251	857.3	853.8	3.5	857.3	853.8	3.5	857.3	853.8	3.5
G8252	857.3	855.0	2.3	857.3	855.0	2.3	857.3	855.0	2.3
G8253	857.8	848.0	9.8	857.8	848.0	9.8	857.8	848.0	9.8
G8254	857.3	857.6	-0.3	857.3	857.6	-0.3	857.3	857.6	-0.3
G8255	857.6	852.2	5.4	857.6	852.1	5.4	857.6	852.2	5.4
G8261	856.8	856.6	0.2	856.8	856.6	0.2	856.8	856.6	0.2
G8273	860.8	861.1	-0.3	860.8	861.1	-0.3	860.8	861.1	-0.3
G8275	857.8	858.7	-0.9	857.8	858.7	-0.9	857.8	858.7	-0.9
G8276	858.3	859.2	-0.9	858.3	859.2	-0.9	858.3	859.2	-0.9

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
G8280	858.4	859.2	-0.8	858.4	859.2	-0.8	858.4	859.2	-0.8
G8326	857.3	858.0	-0.7	857.3	858.0	-0.7	857.3	858.0	-0.7
G8337	857.3	858.1	-0.8	857.3	858.1	-0.8	857.3	858.1	-0.8
G8374	860.8	861.5	-0.7	860.8	861.5	-0.7	860.8	861.5	-0.7
G8380	861.3	861.6	-0.3	861.3	861.6	-0.3	861.3	861.6	-0.3
G8430	863.3	863.5	-0.2	863.3	863.5	-0.2	863.3	863.5	-0.2
G8484	863.3	864.1	-0.8	863.3	864.1	-0.8	863.3	864.1	-0.8
G8502	709.3	0.0	709.3	709.3	0.0	709.3	709.3	0.0	709.3
G8580	864.3	865.2	-0.9	864.3	865.2	-0.9	864.3	865.2	-0.9
G8588	709.3	0.0	709.3	709.3	0.0	709.3	709.3	0.0	709.3
G8590	873.3	873.8	-0.5	873.3	873.8	-0.5	873.3	873.8	-0.5
G8592	873.4	874.2	-0.8	873.4	874.2	-0.8	873.4	874.2	-0.8
G8594	873.4	874.2	-0.8	873.4	874.2	-0.8	873.4	874.2	-0.8
G8600	878.3	874.7	3.6	878.3	874.7	3.6	878.3	874.7	3.6
G8608	872.3	872.8	-0.5	872.3	872.8	-0.5	872.3	872.8	-0.5
G8610	866.3	866.8	-0.5	866.3	866.8	-0.5	866.3	866.8	-0.5
G8611	864.8	865.6	-0.8	864.8	865.6	-0.8	864.8	865.6	-0.8
G8612	864.9	866.0	-1.1	864.9	866.0	-1.1	864.9	866.0	-1.1
G8615	709.3	0.0	709.3	709.3	0.0	709.3	709.3	0.0	709.3
G8618	897.3	891.6	5.7	897.3	891.6	5.7	897.3	891.6	5.7
G8620	873.4	874.2	-0.8	873.4	874.2	-0.8	873.4	874.2	-0.8
G8632	865.3	865.9	-0.6	865.3	865.9	-0.6	865.3	865.9	-0.6
G8678	858.8	859.4	-0.6	858.8	859.4	-0.6	858.8	859.4	-0.6
G8685	865.6	865.8	-0.3	865.6	865.8	-0.3	865.6	865.8	-0.3
G8699	860.3	860.9	-0.6	860.3	860.9	-0.6	860.3	860.9	-0.6
G8710	860.3	860.8	-0.5	860.3	860.8	-0.5	860.3	860.8	-0.5
G8721	868.8	869.0	-0.2	868.8	869.0	-0.2	868.8	869.0	-0.2
G8745	860.4	861.1	-0.7	860.4	861.1	-0.7	860.4	861.1	-0.7
G8765	858.8	859.5	-0.7	858.8	859.5	-0.7	858.8	859.5	-0.7
G8768	866.1	866.3	-0.3	866.1	866.3	-0.3	866.1	866.3	-0.3
G8778	859.3	859.9	-0.6	859.3	859.9	-0.6	859.3	859.9	-0.6
G8783	862.3	862.6	-0.3	862.3	862.6	-0.3	862.3	862.6	-0.3
G8805	902.3	898.1	4.2	902.3	898.1	4.2	902.3	898.1	4.2
G8817	876.3	876.7	-0.4	876.3	876.7	-0.4	876.3	876.7	-0.4
G8820	709.3	0.0	709.3	709.3	0.0	709.3	709.3	0.0	709.3
G8837	870.3	870.9	-0.6	870.3	870.9	-0.6	870.3	870.9	-0.6
G8872	880.8	881.1	-0.3	880.8	881.1	-0.3	880.8	881.1	-0.3
G9023	884.7	885.1	-0.3	884.7	885.1	-0.3	884.7	885.1	-0.3
G9037	872.3	869.2	3.1	872.3	869.2	3.1	872.3	869.2	3.1
G9043	864.5	864.8	-0.3	864.5	864.8	-0.3	864.5	864.8	-0.3

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
G9049	862.1	862.5	-0.5	862.1	862.5	-0.5	862.1	862.5	-0.5
G9051	863.8	864.3	-0.5	863.8	864.3	-0.5	863.8	864.3	-0.5
G9053	875.3	875.9	-0.6	875.3	875.9	-0.6	875.3	875.9	-0.6
G9057	872.3	870.4	1.9	872.3	870.4	1.9	872.3	870.4	1.9
G9066	864.3	864.5	-0.2	864.3	864.5	-0.2	864.3	864.5	-0.2
G9139	898.2	898.4	-0.3	898.2	898.4	-0.3	898.2	898.4	-0.3
G9142	897.4	897.6	-0.2	897.4	897.6	-0.2	897.4	897.6	-0.2
G9143	895.5	895.7	-0.2	895.5	895.7	-0.2	895.5	895.7	-0.2
G9144	885.7	886.1	-0.4	885.7	886.1	-0.4	885.7	886.1	-0.4
G9146	889.1	889.6	-0.5	889.1	889.6	-0.5	889.1	889.6	-0.5
G9147	889.9	890.2	-0.4	889.9	890.2	-0.4	889.9	890.2	-0.4
G9155	881.3	877.3	4.0	881.3	877.3	4.0	881.3	877.3	4.0
G9165	878.3	878.6	-0.3	878.3	878.6	-0.3	878.3	878.6	-0.3
G9226	864.1	864.6	-0.5	864.1	864.6	-0.5	864.1	864.6	-0.5
G9233	876.8	877.3	-0.5	876.8	877.3	-0.5	876.8	877.3	-0.5
G9270	872.0	872.3	-0.3	872.0	872.3	-0.3	872.0	872.3	-0.3
G9274	862.6	863.0	-0.5	862.6	863.0	-0.5	862.6	863.0	-0.5
G9284	864.5	865.0	-0.5	864.5	865.0	-0.5	864.5	865.0	-0.5
G9288	884.6	885.0	-0.4	884.6	885.0	-0.4	884.6	885.0	-0.4
G9289	864.3	864.7	-0.4	864.3	864.7	-0.4	864.3	864.7	-0.4
GC3	871.3	871.7	-0.4	871.3	871.7	-0.4	871.3	871.7	-0.4
I7111	852.3	0.0	852.3	852.3	0.0	852.3	852.3	0.0	852.3
I7166	854.3	847.4	6.9	854.3	847.5	6.8	854.3	847.5	6.8
I7177	854.3	855.3	-1.0	854.3	855.3	-1.0	854.3	855.3	-1.0
I7258	852.3	0.0	852.3	852.3	0.0	852.3	852.3	0.0	852.3
I7290	852.2	0.0	852.2	852.2	0.0	852.2	852.2	0.0	852.2
I7312	852.8	848.3	4.5	852.8	848.3	4.5	852.8	848.3	4.5
I7314	849.0	845.7	3.3	849.0	845.7	3.3	849.0	845.7	3.3
I7336	847.3	844.6	2.7	847.3	844.6	2.7	847.3	844.6	2.7
I7400	851.1	842.6	8.5	851.1	842.6	8.5	851.1	842.6	8.5
I7403	855.0	854.1	0.9	855.0	854.1	0.9	855.0	854.1	0.9
I7420	854.3	847.0	7.3	854.3	847.0	7.3	854.3	847.1	7.2
I7428	854.3	847.9	6.4	854.3	847.9	6.4	854.3	847.9	6.4
I7503	855.1	851.5	3.6	855.1	851.5	3.6	855.1	851.5	3.6
I7517	854.2	849.3	4.9	854.2	849.3	4.9	854.2	849.3	4.9
I7528	854.7	847.9	6.8	854.7	847.9	6.8	854.7	847.9	6.8
I7530	855.2	846.9	8.3	855.2	846.9	8.3	855.2	846.9	8.3
I7532	856.4	847.1	9.3	856.4	847.1	9.3	856.4	847.1	9.3
I7533	855.8	847.6	8.2	855.8	847.6	8.2	855.8	847.6	8.2
I7538	855.3	847.4	7.9	855.3	847.5	7.8	855.3	847.5	7.8

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
I7541	850.5	839.2	11.3	850.5	839.2	11.3	850.5	839.2	11.3
I7549	852.3	846.0	6.3	852.3	846.0	6.3	852.3	846.0	6.3
I7553	850.3	846.1	4.3	850.3	846.0	4.3	850.3	846.0	4.3
I7615	851.0	826.9	24.1	851.0	826.9	24.1	851.0	826.8	24.2
J10015	858.6	860.2	-1.6	858.6	860.2	-1.6	858.6	860.2	-1.6
J10016	858.8	860.1	-1.3	858.8	860.1	-1.3	858.8	860.1	-1.3
J10017	859.3	860.2	-0.9	859.3	860.2	-0.9	859.3	860.2	-0.9
J10018	858.8	860.2	-1.4	858.8	860.2	-1.4	858.8	860.2	-1.4
J10019	859.3	860.2	-0.9	859.3	860.2	-0.9	859.3	860.2	-0.9
J10021	860.3	860.4	-0.1	860.3	860.4	-0.1	860.3	860.4	-0.1
J10022	860.3	860.4	-0.1	860.3	860.3	0.0	860.3	860.4	-0.1
J10025	865.3	860.8	4.5	865.3	860.7	4.6	865.3	860.6	4.7
J10030	870.3	865.3	5.0	870.3	865.3	5.0	870.3	865.3	5.0
J10074	858.3	860.2	-1.9	858.3	860.3	-2.0	858.3	860.3	-2.0
J10106	858.2	860.3	-2.1	858.2	860.3	-2.1	858.2	860.3	-2.1
J10110	856.7	860.3	-3.6	856.7	860.3	-3.6	856.7	860.3	-3.6
J10131	860.3	860.5	-0.2	860.3	860.5	-0.2	860.3	860.5	-0.2
J10190	864.1	865.4	-1.4	864.1	865.4	-1.4	864.1	865.4	-1.4
J10191	860.3	861.0	-0.7	860.3	861.0	-0.7	860.3	861.0	-0.7
J10210	865.0	865.4	-0.4	865.0	865.4	-0.4	865.0	865.4	-0.4
J10219	869.3	869.8	-0.5	869.3	869.8	-0.5	869.3	869.8	-0.5
J10220	862.3	862.5	-0.2	862.3	862.5	-0.2	862.3	862.5	-0.2
J10237	865.0	865.4	-0.4	865.0	865.4	-0.4	865.0	865.4	-0.4
J10337	869.3	869.7	-0.4	869.3	869.7	-0.4	869.3	869.7	-0.4
J10409	887.3	885.9	1.4	887.3	885.9	1.4	887.3	885.9	1.4
J10420	862.3	862.9	-0.6	862.3	862.9	-0.6	862.3	862.9	-0.6
J10489	869.3	869.4	-0.1	869.3	869.4	-0.1	869.3	869.4	-0.1
J10491	865.8	865.9	-0.1	865.8	865.9	-0.1	865.8	865.9	-0.1
J10492	869.3	869.5	-0.2	869.3	869.5	-0.2	869.3	869.5	-0.2
J10495	861.8	862.1	-0.3	861.8	862.1	-0.3	861.8	862.1	-0.3
J10496	861.8	861.9	-0.1	861.8	861.9	-0.1	861.8	861.9	-0.1
J10497	861.8	862.3	-0.5	861.8	862.3	-0.5	861.8	862.3	-0.5
J10498	861.6	861.9	-0.4	861.6	861.9	-0.4	861.6	861.9	-0.4
J10501	861.6	862.1	-0.5	861.6	862.1	-0.5	861.6	862.1	-0.5
J10504	862.3	862.8	-0.5	862.3	862.8	-0.5	862.3	862.8	-0.5
J10521	862.3	863.0	-0.7	862.3	863.0	-0.7	862.3	863.0	-0.7
J10533	873.3	873.5	-0.2	873.3	873.5	-0.2	873.3	873.5	-0.2
J10584	862.3	863.0	-0.7	862.3	863.0	-0.7	862.3	863.0	-0.7
J10600	865.3	865.4	-0.1	865.3	865.4	-0.1	865.3	865.4	-0.1
J10613	881.3	878.9	2.4	881.3	878.9	2.4	881.3	878.9	2.4

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
J10614	885.3	885.9	-0.6	885.3	885.9	-0.6	885.3	885.9	-0.6
J10621	885.3	885.9	-0.6	885.3	885.9	-0.6	885.3	885.9	-0.6
J10629	862.3	863.0	-0.7	862.3	863.0	-0.7	862.3	863.0	-0.7
J10632	869.3	869.7	-0.4	869.3	869.7	-0.4	869.3	869.7	-0.4
J10636	861.8	863.0	-1.2	861.8	863.0	-1.2	861.8	863.0	-1.2
J10642	862.3	863.0	-0.7	862.3	863.0	-0.7	862.3	863.0	-0.7
J10725	862.3	863.1	-0.8	862.3	863.1	-0.8	862.3	863.1	-0.8
J10775	863.3	863.9	-0.6	863.3	863.9	-0.6	863.3	863.9	-0.6
J10810	863.8	864.5	-0.7	863.8	864.5	-0.7	863.8	864.5	-0.7
J10842	864.3	864.9	-0.6	864.3	864.9	-0.6	864.3	864.9	-0.6
J10967	865.3	865.9	-0.6	865.3	865.9	-0.6	865.3	865.9	-0.6
J11079	865.4	866.0	-0.6	865.4	866.0	-0.6	865.4	866.0	-0.6
J11109	865.3	866.1	-0.8	865.3	866.1	-0.8	865.3	866.1	-0.8
J11159	880.3	880.9	-0.6	880.3	880.9	-0.6	880.3	880.9	-0.6
J11160	880.4	881.6	-1.2	880.4	881.6	-1.1	880.4	881.6	-1.2
J11163	881.3	881.8	-0.5	881.3	881.8	-0.5	881.3	881.8	-0.5
J11170	876.3	877.1	-0.8	876.3	877.1	-0.8	876.3	877.1	-0.8
J11176	875.3	875.7	-0.4	875.3	875.7	-0.4	875.3	875.7	-0.4
J11186	880.4	881.5	-1.1	880.4	881.4	-1.0	880.4	881.5	-1.1
J11187	880.4	881.4	-1.0	880.4	881.4	-1.0	880.4	881.4	-1.0
J11211	871.3	871.6	-0.3	871.3	871.6	-0.3	871.3	871.6	-0.3
J11213	867.3	867.6	-0.3	867.3	867.6	-0.3	867.3	867.6	-0.3
J11220	865.4	866.1	-0.7	865.4	866.1	-0.7	865.4	866.1	-0.7
J11226	867.4	868.0	-0.6	867.4	868.0	-0.6	867.4	868.0	-0.6
J11227	866.3	867.0	-0.7	866.3	867.0	-0.7	866.3	867.0	-0.7
J11228	867.3	867.8	-0.5	867.3	867.8	-0.5	867.3	867.8	-0.5
J11230	866.4	867.1	-0.6	866.4	867.0	-0.6	866.4	867.0	-0.6
J11232	865.4	866.2	-0.8	865.4	866.2	-0.8	865.4	866.2	-0.8
J11315	866.4	867.0	-0.6	866.4	867.0	-0.6	866.4	867.0	-0.6
J11456	867.3	867.7	-0.4	867.3	867.7	-0.4	867.3	867.7	-0.4
J11572	868.3	868.7	-0.4	868.3	868.7	-0.4	868.3	868.7	-0.4
J11637	868.3	868.7	-0.4	868.3	868.7	-0.4	868.3	868.7	-0.4
J3251	852.3	848.6	3.7	852.3	848.6	3.7	852.3	848.6	3.7
J4567	854.3	854.7	-0.4	854.3	854.7	-0.4	854.3	854.7	-0.4
J4596	847.3	847.6	-0.3	847.3	847.6	-0.3	847.3	847.6	-0.3
J4597	851.8	852.0	-0.2	851.8	852.0	-0.2	851.8	852.0	-0.2
J4663	846.3	846.6	-0.3	846.3	846.6	-0.3	846.3	846.6	-0.3
J4734	844.3	844.8	-0.5	844.3	844.8	-0.5	844.3	844.8	-0.5
J4745	855.3	853.6	1.7	855.3	853.6	1.7	855.3	853.6	1.7
J4764	844.1	844.7	-0.6	844.1	844.7	-0.6	844.1	844.7	-0.6

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
J4859	849.4	850.5	-1.1	849.4	850.5	-1.1	849.4	850.5	-1.1
J4891	851.1	848.1	2.9	851.1	848.1	2.9	851.1	848.1	2.9
J4937	843.3	844.1	-0.8	843.3	844.1	-0.8	843.3	844.1	-0.8
J4977	852.8	853.0	-0.2	852.8	853.0	-0.2	852.8	853.0	-0.2
J5004	852.3	852.4	-0.1	852.3	852.4	-0.1	852.3	852.4	-0.1
J5085	846.3	845.5	0.8	846.3	845.5	0.8	846.3	845.5	0.8
J5104	852.3	852.5	-0.2	852.3	852.5	-0.2	852.3	852.5	-0.2
J5168	851.8	851.9	-0.1	851.8	851.9	-0.1	851.8	851.9	-0.1
J5205	850.3	847.1	3.2	850.3	847.1	3.2	850.3	847.1	3.2
J5207	113.3	0.0	113.3	113.3	0.0	113.3	113.3	0.0	113.3
J5209	112.3	0.0	112.3	112.3	0.0	112.3	112.3	0.0	112.3
J5212	123.1	0.0	123.1	123.1	0.0	123.1	123.1	0.0	123.1
J5228	843.1	843.4	-0.3	843.1	843.4	-0.3	843.1	843.4	-0.3
J5236	842.8	843.4	-0.6	842.8	843.4	-0.6	842.8	843.4	-0.6
J5259	842.3	842.9	-0.6	842.3	842.9	-0.6	842.3	842.9	-0.6
J5271	843.8	844.3	-0.5	843.8	844.3	-0.5	843.8	844.3	-0.5
J5285	841.8	842.1	-0.3	841.8	842.1	-0.3	841.8	842.1	-0.3
J5293	843.8	844.2	-0.4	843.8	844.2	-0.4	843.8	844.2	-0.4
J5323	849.1	849.3	-0.2	849.1	849.3	-0.2	849.1	849.3	-0.2
J5325	842.0	842.9	-0.9	842.0	842.9	-0.9	842.0	842.9	-0.9
J5363	843.6	843.9	-0.4	843.6	843.9	-0.4	843.6	843.9	-0.4
J5411	840.3	840.7	-0.4	840.3	840.7	-0.4	840.3	840.7	-0.4
J5415	841.8	842.8	-1.0	841.8	842.8	-1.0	841.8	842.8	-1.0
J5461	841.2	843.0	-1.8	841.2	843.0	-1.8	841.2	843.0	-1.8
J5475	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0
J5507	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0
J5516	841.1	842.9	-1.8	841.1	842.9	-1.8	841.1	842.9	-1.8
J5517	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0
J5531	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0
J5537	839.6	839.9	-0.4	839.6	839.9	-0.4	839.6	839.9	-0.4
J5540	839.3	839.6	-0.3	839.3	839.6	-0.3	839.3	839.6	-0.3
J5580	839.7	842.9	-3.3	839.7	842.9	-3.3	839.7	842.9	-3.3
J5628	837.3	837.7	-0.4	837.3	837.7	-0.4	837.3	837.7	-0.4
J5648	838.4	838.8	-0.4	838.4	838.8	-0.4	838.4	838.8	-0.4
J5683	841.4	839.5	1.9	841.4	839.5	1.9	841.4	839.5	1.9
J5696	838.2	838.5	-0.3	838.2	838.5	-0.3	838.2	838.5	-0.3
J5702	843.3	841.5	1.9	843.3	841.5	1.9	843.3	841.5	1.9
J5707	836.3	836.7	-0.4	836.3	836.7	-0.4	836.3	836.7	-0.4
J5752	835.3	835.9	-0.6	835.3	835.9	-0.6	835.3	835.9	-0.6
J5758	853.0	839.7	13.4	853.0	839.7	13.4	853.0	839.7	13.4

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
J5775	846.6	846.7	-0.1	846.6	846.7	-0.1	846.6	846.6	0.0
J5826	862.0	839.7	22.3	862.0	839.7	22.3	862.0	839.7	22.3
J5860	836.3	837.5	-1.3	836.3	837.6	-1.3	836.3	837.5	-1.3
J5891	846.6	846.6	0.0	846.6	846.7	-0.1	846.6	846.6	0.0
J5905	854.3	839.7	14.6	854.3	839.7	14.6	854.3	839.7	14.6
J5926	833.1	837.2	-4.1	833.1	837.2	-4.1	833.1	837.2	-4.1
J5935	831.3	831.8	-0.5	831.3	831.8	-0.5	831.3	831.8	-0.5
J5965	840.3	837.1	3.1	840.3	837.1	3.1	840.3	837.1	3.1
J5997	845.7	846.2	-0.5	845.7	846.2	-0.5	845.7	846.2	-0.5
J6011	845.8	846.1	-0.3	845.8	846.1	-0.3	845.8	846.1	-0.3
J6025	836.3	837.5	-1.3	836.3	837.5	-1.3	836.3	837.5	-1.3
J6068	850.3	850.8	-0.5	850.3	850.8	-0.5	850.3	850.8	-0.5
J6075	848.2	848.4	-0.2	848.2	848.4	-0.2	848.2	848.4	-0.2
J6079	836.3	837.5	-1.3	836.3	837.5	-1.3	836.3	837.5	-1.3
J6120	842.9	843.2	-0.3	842.9	843.2	-0.3	842.9	843.2	-0.3
J6131	832.2	832.6	-0.4	832.2	832.6	-0.4	832.2	832.6	-0.4
J6143	850.3	850.5	-0.2	850.3	850.5	-0.2	850.3	850.5	-0.2
J6164	850.3	850.8	-0.5	850.3	850.8	-0.5	850.3	850.8	-0.5
J6211	837.3	837.4	-0.1	837.3	837.4	-0.1	837.3	837.4	-0.1
J6227	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0
J6231	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0
J6233	840.2	840.9	-0.7	840.2	840.9	-0.7	840.2	840.9	-0.7
J6237	829.3	827.6	1.7	829.3	828.1	1.2	829.3	828.0	1.3
J6291	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0
J6320	825.4	824.5	0.9	825.4	824.5	0.9	825.4	824.5	0.9
J6366	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0
J6392	840.1	840.5	-0.4	840.1	840.5	-0.4	840.1	840.5	-0.4
J6408	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0
J6450	821.3	823.3	-2.0	821.3	823.3	-2.0	821.3	823.3	-2.0
J6463	821.3	823.3	-2.0	821.3	823.3	-2.0	821.3	823.3	-2.0
J6467	827.1	827.9	-0.8	827.1	827.9	-0.8	827.1	827.9	-0.8
J6468	821.3	823.3	-2.0	821.3	823.3	-2.0	821.3	823.3	-2.0
J6469	825.4	825.3	0.1	825.4	825.2	0.2	825.4	825.3	0.1
J6471	829.3	829.9	-0.6	829.3	829.9	-0.6	829.3	829.9	-0.6
J6477	830.3	831.0	-0.7	830.3	831.0	-0.7	830.3	831.0	-0.7
J6483	838.3	837.3	1.0	838.3	837.3	1.0	838.3	837.3	1.0
J6495	838.3	838.9	-0.6	838.3	838.9	-0.6	838.3	838.9	-0.6
J6501	839.3	839.9	-0.6	839.3	839.9	-0.6	839.3	839.9	-0.6
J6507	839.3	839.9	-0.6	839.3	840.0	-0.7	839.3	839.9	-0.6
J6517	819.4	823.3	-3.9	819.4	823.3	-3.9	819.4	823.3	-3.9

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
J6518	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0
J6521	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0
J6595	828.6	826.0	2.6	828.6	826.0	2.6	828.6	826.0	2.6
J6677	828.6	826.9	1.7	828.6	826.8	1.8	828.6	826.8	1.8
J6698	826.3	826.8	-0.5	826.3	826.8	-0.5	826.3	826.8	-0.5
J6705	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0
J6721	833.0	827.4	5.6	833.0	827.3	5.7	833.0	827.3	5.7
J6759	830.4	827.4	2.9	830.4	827.4	3.0	830.4	827.4	3.0
J6762	828.3	828.8	-0.5	828.3	828.8	-0.5	828.3	828.8	-0.5
J6769	830.4	827.4	2.9	830.4	827.4	3.0	830.4	827.4	2.9
J6806	842.3	841.6	0.7	842.3	841.6	0.7	842.3	841.6	0.7
J6810	846.3	842.0	4.3	846.3	842.0	4.3	846.3	842.0	4.3
J6811	849.3	843.0	6.3	849.3	843.0	6.3	849.3	843.0	6.3
J6822	825.2	827.5	-2.3	825.2	827.4	-2.2	825.2	827.5	-2.3
J6851	830.6	830.7	-0.1	830.6	830.7	-0.1	830.6	830.7	-0.1
J6871	835.3	836.1	-0.8	835.3	836.1	-0.8	835.3	836.1	-0.8
J6876	835.3	836.1	-0.8	835.3	836.1	-0.8	835.3	836.1	-0.8
J6883	839.3	840.0	-0.7	839.3	840.0	-0.7	839.3	840.0	-0.7
J6892	839.3	839.6	-0.3	839.3	839.6	-0.3	839.3	839.6	-0.3
J6904	842.3	841.1	1.2	842.3	841.1	1.2	842.3	841.1	1.2
J6908	837.8	830.4	7.4	837.8	830.3	7.4	837.8	830.4	7.4
J6915	826.9	829.5	-2.6	826.9	829.5	-2.6	826.9	829.5	-2.6
J6963	834.5	831.3	3.2	834.5	831.3	3.2	834.5	831.3	3.2
J6997	839.3	833.1	6.2	839.3	833.1	6.2	839.3	833.1	6.2
J6999	836.3	836.7	-0.4	836.3	836.7	-0.4	836.3	836.7	-0.4
J7000	875.3	875.7	-0.4	875.3	875.7	-0.4	875.3	875.7	-0.4
J7009	825.8	822.8	3.0	825.8	822.8	3.0	825.8	822.8	3.0
J7010	823.6	827.5	-3.9	823.6	827.4	-3.8	823.6	827.5	-3.8
J7019	823.7	827.5	-3.9	823.7	827.5	-3.8	823.7	827.5	-3.8
J7021	846.3	835.1	11.2	846.3	835.1	11.2	846.3	835.1	11.2
J7027	830.8	829.6	1.2	830.8	829.6	1.3	830.8	829.6	1.2
J7028	823.6	827.5	-3.9	823.6	827.4	-3.8	823.6	827.5	-3.8
J7032	872.8	873.1	-0.3	872.8	873.1	-0.3	872.8	873.1	-0.3
J7038	845.2	845.6	-0.4	845.2	845.6	-0.4	845.2	845.6	-0.4
J7051	831.3	831.6	-0.3	831.3	831.6	-0.3	831.3	831.6	-0.3
J7053	868.3	868.6	-0.3	868.3	868.6	-0.3	868.3	868.6	-0.3
J7062	832.9	833.2	-0.3	832.9	833.2	-0.3	832.9	833.2	-0.3
J7067	866.3	866.6	-0.3	866.3	866.6	-0.3	866.3	866.6	-0.3
J7070	861.5	861.8	-0.3	861.5	861.8	-0.3	861.5	861.8	-0.3
J7073	823.6	827.5	-3.8	823.6	827.4	-3.8	823.6	827.4	-3.8

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
J7084	843.1	843.6	-0.5	843.1	843.6	-0.5	843.1	843.6	-0.5
J7092	827.7	827.5	0.2	827.7	827.4	0.3	827.7	827.4	0.3
J7108	851.3	849.6	1.7	851.3	849.6	1.7	851.3	849.7	1.6
J7134	833.3	830.9	2.4	833.3	830.8	2.5	833.3	830.8	2.5
J7153	836.9	836.0	0.9	836.9	836.0	0.9	836.9	836.0	0.9
J7175	849.5	849.6	-0.1	849.5	849.6	-0.1	849.5	849.6	-0.1
J7180	833.3	830.8	2.5	833.3	830.8	2.5	833.3	830.8	2.5
J7242	835.8	835.4	0.4	835.8	835.4	0.4	835.8	835.4	0.4
J7277	835.8	836.3	-0.5	835.8	836.3	-0.5	835.8	836.3	-0.5
J7292	836.3	836.6	-0.3	836.3	836.6	-0.3	836.3	836.6	-0.3
J7301	838.3	837.7	0.6	838.3	837.7	0.6	838.3	837.7	0.6
J7325	841.0	839.9	1.1	841.0	839.9	1.1	841.0	839.9	1.1
J7361	845.4	845.7	-0.3	845.4	845.7	-0.3	845.4	845.7	-0.3
J7363	841.8	841.8	0.0	841.8	841.8	0.0	841.8	841.8	0.0
J7366	857.6	857.9	-0.3	857.6	857.9	-0.3	857.6	857.9	-0.3
J7368	836.3	836.9	-0.6	836.3	836.9	-0.6	836.3	836.9	-0.6
J7372	845.3	843.1	2.2	845.3	843.1	2.2	845.3	843.1	2.2
J7377	840.3	840.6	-0.3	840.3	840.6	-0.3	840.3	840.6	-0.3
J7391	844.1	844.0	0.0	844.1	844.0	0.0	844.1	844.0	0.0
J7411	915.3	915.6	-0.3	915.3	915.6	-0.3	915.3	915.6	-0.3
J7416	915.3	915.4	-0.1	915.3	915.4	-0.1	915.3	915.4	-0.1
J7425	862.8	864.5	-1.7	862.8	864.5	-1.7	862.8	864.5	-1.7
J7445	909.3	909.5	-0.2	909.3	909.5	-0.2	909.3	909.5	-0.2
J7464	863.3	864.5	-1.2	863.3	864.5	-1.2	863.3	864.5	-1.2
J7543	860.8	860.9	-0.2	860.8	860.9	-0.2	860.8	860.9	-0.2
J7565	865.3	864.7	0.6	865.3	864.7	0.6	865.3	864.7	0.6
J7566	904.3	904.5	-0.2	904.3	904.5	-0.2	904.3	904.5	-0.2
J7570	865.3	864.9	0.4	865.3	864.9	0.4	865.3	864.9	0.4
J7576	864.8	865.2	-0.4	864.8	865.2	-0.4	864.8	865.2	-0.4
J7600	866.7	845.0	21.7	866.7	845.0	21.7	866.7	845.0	21.7
J7609	866.7	845.6	21.1	866.7	845.6	21.1	866.7	845.6	21.1
J7611	861.6	861.8	-0.3	861.6	861.8	-0.3	861.6	861.8	-0.3
J7643	896.3	891.5	4.8	896.3	891.5	4.8	896.3	891.6	4.7
J7663	866.7	846.3	20.4	866.7	846.3	20.4	866.7	846.3	20.4
J7735	872.9	873.3	-0.3	872.9	873.3	-0.3	872.9	873.3	-0.3
J7737	877.3	877.6	-0.3	877.3	877.6	-0.3	877.3	877.6	-0.3
J7739	709.3	0.0	709.3	709.3	0.0	709.3	709.3	0.0	709.3
J7774	885.3	885.6	-0.3	885.3	885.6	-0.3	885.3	885.6	-0.3
J7776	897.3	894.6	2.7	897.3	894.6	2.7	897.3	894.6	2.7
J7778	880.3	880.6	-0.3	880.3	880.6	-0.3	880.3	880.6	-0.3

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
J7781	894.8	893.3	1.5	894.8	893.3	1.5	894.8	893.3	1.5
J7946	875.3	875.5	-0.2	875.3	875.5	-0.2	875.3	875.5	-0.2
J7973	877.3	877.5	-0.2	877.3	877.5	-0.2	877.3	877.5	-0.2
J7977	709.3	0.0	709.3	709.3	0.0	709.3	709.3	0.0	709.3
J7993	879.3	879.5	-0.2	879.3	879.5	-0.2	879.3	879.5	-0.2
J8043	870.5	846.6	23.9	870.5	846.6	23.9	870.5	846.6	23.9
J8061	709.3	0.0	709.3	709.3	0.0	709.3	709.3	0.0	709.3
J8063	882.3	882.5	-0.2	882.3	882.5	-0.2	882.3	882.5	-0.2
J8085	886.3	886.7	-0.4	886.3	886.7	-0.4	886.3	886.7	-0.4
J8108	897.8	898.0	-0.2	897.8	898.0	-0.2	897.8	898.0	-0.2
J8136	886.3	886.5	-0.2	886.3	886.5	-0.2	886.3	886.5	-0.2
J8427	870.5	848.5	22.0	870.5	848.5	22.0	870.5	848.5	22.0
J8442	872.3	850.5	21.8	872.3	850.5	21.8	872.3	850.5	21.8
J8469	872.3	852.7	19.6	872.3	852.7	19.6	872.3	852.7	19.6
J8475	898.3	897.8	0.5	898.3	897.8	0.5	898.3	897.8	0.5
J8539	870.6	853.0	17.5	870.6	853.0	17.6	870.6	853.0	17.6
J8557	897.3	890.3	7.0	897.3	890.3	7.0	897.3	890.3	7.0
J8558	893.8	887.8	6.0	893.8	887.8	6.0	893.8	887.8	6.0
J8561	891.3	886.3	5.0	891.3	886.3	5.0	891.3	886.3	5.0
J8596	891.3	884.1	7.2	891.3	884.1	7.2	891.3	884.1	7.2
J8625	869.8	854.6	15.2	869.8	854.6	15.2	869.8	854.6	15.2
J8626	869.8	854.7	15.2	869.8	854.7	15.1	869.8	854.7	15.1
J8810	867.6	859.1	8.5	867.6	859.1	8.5	867.6	859.1	8.5
J8838	910.0	910.2	-0.2	910.0	910.2	-0.2	910.0	910.2	-0.2
J8846	900.3	900.6	-0.3	900.3	900.6	-0.3	900.3	900.6	-0.3
J8847	889.0	889.3	-0.3	889.0	889.3	-0.3	889.0	889.3	-0.3
J8863	863.8	863.8	0.0	863.8	863.8	0.0	863.8	863.8	0.0
J8877	876.1	876.4	-0.3	876.1	876.4	-0.3	876.1	876.4	-0.3
J8901	862.3	862.5	-0.2	862.3	862.5	-0.2	862.3	862.5	-0.2
J9041	860.3	857.7	2.6	860.3	858.3	2.0	860.3	857.7	2.6
J9055	860.6	861.7	-1.1	860.6	861.7	-1.1	860.6	861.7	-1.1
J9157	866.3	860.6	5.7	866.3	860.6	5.7	866.3	860.6	5.7
J9162	876.3	876.5	-0.2	876.3	876.5	-0.2	876.3	876.5	-0.2
J9167	870.3	870.5	-0.2	870.3	870.5	-0.2	870.3	870.5	-0.2
J9174	890.3	890.4	-0.1	890.3	890.4	-0.1	890.3	890.4	-0.1
J9179	882.8	882.9	-0.1	882.8	882.9	-0.1	882.8	882.9	-0.1
J9184	868.3	868.5	-0.2	868.3	868.5	-0.2	868.3	868.5	-0.2
J9185	875.3	875.5	-0.2	875.3	875.5	-0.2	875.3	875.5	-0.2
J9188	882.3	882.5	-0.2	882.3	882.5	-0.2	882.3	882.5	-0.2
J9189	864.3	864.4	-0.1	864.3	864.4	-0.1	864.3	864.4	-0.1

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
J9190	894.3	894.4	-0.1	894.3	894.4	-0.1	894.3	894.4	-0.1
J9245	860.3	860.5	-0.2	860.3	860.5	-0.2	860.3	860.5	-0.2
J9373	859.8	860.1	-0.3	859.8	860.0	-0.2	859.8	860.0	-0.2
J9419	859.3	860.2	-0.9	859.3	860.2	-0.9	859.3	860.2	-0.9
J9461	888.3	888.9	-0.6	888.3	888.9	-0.6	888.3	888.9	-0.6
J9537	859.3	860.2	-0.9	859.3	860.1	-0.8	859.3	860.1	-0.8
J9794	858.3	860.1	-1.8	858.3	860.1	-1.8	858.3	860.1	-1.8
J9797	857.3	860.4	-3.1	857.3	860.4	-3.1	857.3	860.4	-3.1
J9802	870.3	870.6	-0.3	870.3	870.6	-0.3	870.3	870.6	-0.3
J9807	888.3	887.7	0.6	888.3	887.7	0.6	888.3	887.7	0.6
J9809	887.8	888.0	-0.2	887.8	888.0	-0.2	887.8	888.0	-0.2
J9810	860.4	861.0	-0.6	860.4	861.0	-0.6	860.4	861.0	-0.6
J9811	887.4	888.1	-0.7	887.4	888.1	-0.7	887.4	888.1	-0.7
J9817	883.3	878.9	4.4	883.3	878.9	4.4	883.3	878.9	4.4
J9874	858.3	860.1	-1.8	858.3	860.1	-1.8	858.3	860.1	-1.8
J9885	895.3	895.4	-0.1	895.3	895.4	-0.1	895.3	895.4	-0.1
J9907	889.3	889.5	-0.2	889.3	889.5	-0.2	889.3	889.5	-0.2
J9915	888.3	888.5	-0.2	888.3	888.5	-0.2	888.3	888.5	-0.2
J9920	881.3	881.5	-0.2	881.3	881.5	-0.2	881.3	881.5	-0.2
J9922	871.3	871.6	-0.3	871.3	871.6	-0.3	871.3	871.6	-0.3
J9923	874.3	874.6	-0.3	874.3	874.6	-0.3	874.3	874.6	-0.3
J9924	861.3	861.5	-0.2	861.3	861.5	-0.2	861.3	861.5	-0.2
J9934	858.4	860.1	-1.7	858.4	860.1	-1.7	858.4	860.1	-1.7
J9941	858.8	860.1	-1.3	858.8	860.1	-1.3	858.8	860.1	-1.3
J9942	859.4	860.4	-1.0	859.4	860.4	-1.0	859.4	860.4	-1.0
J9949	859.3	859.9	-0.6	859.3	859.9	-0.6	859.3	859.9	-0.6
J9952	860.3	861.0	-0.7	860.3	861.0	-0.7	860.3	861.0	-0.7
J9986	858.4	860.1	-1.7	858.4	860.1	-1.7	858.4	860.1	-1.7
JDOT1	855.1	846.8	8.3	855.1	846.8	8.3	855.1	846.8	8.3
JDOT2	836.9	838.5	-1.6	836.9	838.5	-1.6	836.9	838.5	-1.6
JDOT3	827.7	827.3	0.4	827.7	827.2	0.4	827.7	827.2	0.4
JDOT4	826.3	826.1	0.2	826.3	826.1	0.2	826.3	826.1	0.2
JDUNWOODY	815.3	823.5	-8.2	815.3	823.5	-8.2	815.3	823.4	-8.1
JMPRB1	819.3	823.5	-4.2	819.3	823.5	-4.2	819.3	823.5	-4.2
JMPRB2	820.5	823.6	-3.1	820.5	823.6	-3.1	820.5	823.6	-3.1
JUNCT	855.5	819.3	36.2	855.5	819.1	36.4	855.5	819.2	36.3
KINGS PND	846.5	861.3	-14.8	846.5	861.3	-14.8	846.5	861.3	-14.8
L14613	866.3	866.7	-0.4	866.3	866.7	-0.4	866.3	866.7	-0.4
L14670	864.6	866.0	-1.4	864.6	866.0	-1.4	864.6	866.0	-1.4
L14678	865.1	866.5	-1.4	865.1	866.5	-1.4	865.1	866.5	-1.4

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
L14731	865.4	866.0	-0.7	865.4	866.0	-0.7	865.4	866.0	-0.7
L14732	865.8	866.5	-0.7	865.8	866.5	-0.7	865.8	866.5	-0.7
L14897	865.8	866.4	-0.6	865.8	866.4	-0.6	865.8	866.4	-0.6
L14973	865.8	866.3	-0.5	865.8	866.3	-0.5	865.8	866.3	-0.5
L14975	865.6	866.0	-0.5	865.6	866.0	-0.5	865.6	866.0	-0.5
L14984	865.8	866.4	-0.6	865.8	866.4	-0.6	865.8	866.4	-0.6
L14989	863.3	861.1	2.2	863.3	861.2	2.1	863.3	861.3	2.0
L14992	866.6	866.3	0.3	866.6	866.3	0.3	866.6	866.3	0.3
L15000	865.3	865.7	-0.4	865.3	865.7	-0.4	865.3	865.7	-0.4
L15004	862.3	863.3	-1.0	862.3	863.4	-1.1	862.3	863.3	-1.0
L15005	862.8	863.4	-0.6	862.8	863.4	-0.6	862.8	863.3	-0.5
L15010	862.8	862.5	0.3	862.8	862.7	0.1	862.8	862.6	0.2
L15011	862.8	863.3	-0.5	862.8	863.3	-0.5	862.8	863.3	-0.5
L15012	862.8	863.1	-0.3	862.8	863.2	-0.4	862.8	863.1	-0.3
L15020	863.3	859.8	3.5	863.3	859.8	3.5	863.3	859.8	3.5
L15327	865.1	863.4	1.7	865.1	863.6	1.5	865.1	863.1	1.9
L15417	869.7	870.7	-1.0	869.7	870.7	-1.0	869.7	870.7	-1.0
L15484	870.2	870.7	-0.5	870.2	870.7	-0.5	870.2	870.7	-0.5
L15533	868.8	867.6	1.2	868.8	867.9	0.9	868.8	867.1	1.7
L15576	868.3	868.7	-0.4	868.3	868.7	-0.4	868.3	868.7	-0.4
L15577	869.3	869.6	-0.3	869.3	869.6	-0.3	869.3	869.6	-0.3
L15578	869.3	869.5	-0.2	869.3	869.5	-0.2	869.3	869.5	-0.2
L15581	868.3	868.8	-0.5	868.3	868.8	-0.5	868.3	868.8	-0.5
L15583	871.3	868.8	2.5	871.3	868.9	2.4	871.3	868.6	2.7
L15587	868.8	868.1	0.7	868.8	868.4	0.4	868.8	867.7	1.1
L15588	871.3	869.0	2.3	871.3	869.1	2.2	871.3	868.9	2.4
L15591	870.8	869.0	1.8	870.8	869.0	1.8	870.8	868.9	1.9
L15593	868.3	868.1	0.2	868.3	868.4	-0.1	868.3	867.9	0.4
L15594	868.3	868.6	-0.3	868.3	868.6	-0.3	868.3	868.5	-0.2
L15596	868.3	868.6	-0.3	868.3	868.6	-0.3	868.3	868.6	-0.3
L15598	869.3	869.1	0.2	869.3	869.1	0.2	869.3	869.1	0.2
L15600	870.3	869.5	0.8	870.3	869.5	0.8	870.3	869.5	0.8
L15605	867.8	868.1	-0.3	867.8	868.3	-0.5	867.8	867.9	-0.1
L15653	868.3	868.8	-0.5	868.3	868.8	-0.5	868.3	868.8	-0.5
L15854	870.3	869.8	0.5	870.3	869.8	0.5	870.3	869.8	0.5
L15857	869.8	869.9	-0.1	869.8	869.9	-0.1	869.8	869.9	-0.1
L15860	869.1	869.9	-0.9	869.1	869.9	-0.9	869.1	869.9	-0.9
L15861	869.6	870.0	-0.5	869.6	870.0	-0.5	869.6	870.0	-0.5
L15862	869.3	870.0	-0.7	869.3	870.0	-0.7	869.3	870.0	-0.7
L15867	871.3	871.7	-0.4	871.3	871.7	-0.4	871.3	871.7	-0.4

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
L15868	870.3	870.7	-0.4	870.3	870.7	-0.4	870.3	870.7	-0.4
L15870	871.3	871.9	-0.6	871.3	871.9	-0.6	871.3	871.9	-0.6
L16039	872.3	870.7	1.6	872.3	870.7	1.6	872.3	870.7	1.6
L16086	871.2	872.3	-1.2	871.2	872.3	-1.2	871.2	872.3	-1.2
L16092	868.8	869.1	-0.3	868.8	869.1	-0.3	868.8	869.1	-0.3
L16228	869.3	869.5	-0.2	869.3	869.5	-0.2	869.3	869.5	-0.2
L16313	869.3	869.6	-0.3	869.3	869.6	-0.3	869.3	869.6	-0.3
L16318	872.3	872.4	-0.1	872.3	872.4	-0.1	872.3	872.4	-0.1
Lake-2nd	865.5	865.9	-0.4	865.5	865.9	-0.4	865.5	865.9	-0.4
Lake-3rd	864.8	865.1	-0.2	864.8	865.1	-0.2	864.8	865.1	-0.2
Lake-3rd-2	865.2	865.5	-0.3	865.2	865.5	-0.3	865.2	865.5	-0.3
Lake-4th	865.0	865.5	-0.5	865.0	865.5	-0.5	865.0	865.5	-0.5
Lake-4th-2	864.5	865.5	-1.0	864.5	865.5	-1.0	864.5	865.5	-1.0
Lake-Clin	861.8	863.4	-1.6	861.8	863.4	-1.6	861.8	863.4	-1.6
Lake-Clin2	862.1	863.5	-1.3	862.1	863.5	-1.4	862.1	863.5	-1.3
Lake-Clin3	861.6	863.5	-1.8	861.6	863.5	-1.8	861.6	863.5	-1.8
LORINGPK	835.5	827.3	8.2	835.5	827.3	8.2	835.5	827.3	8.2
M13902	873.7	873.9	-0.2	873.7	873.9	-0.2	873.7	873.9	-0.2
M13907	872.3	871.7	0.6	872.3	871.7	0.6	872.3	871.8	0.5
M14065	871.3	871.3	0.0	871.3	871.3	0.0	871.3	871.3	0.0
M14081	871.1	871.1	0.0	871.1	871.1	0.0	871.1	871.1	0.0
M14234	870.8	870.9	-0.1	870.8	870.9	-0.1	870.8	870.9	-0.1
M14298	872.1	872.7	-0.6	872.1	872.7	-0.6	872.1	872.7	-0.6
M14368-1	871.0	870.7	0.2	871.0	870.8	0.2	871.0	870.8	0.2
M14368-2	871.6	871.9	-0.4	871.6	871.9	-0.4	871.6	871.9	-0.4
M14370	869.2	869.6	-0.4	869.2	869.6	-0.4	869.2	869.6	-0.4
M14371	868.3	869.0	-0.7	868.3	869.0	-0.7	868.3	869.0	-0.7
M14372	869.8	870.3	-0.5	869.8	870.3	-0.5	869.8	870.3	-0.5
M14373	869.1	869.5	-0.4	869.1	869.5	-0.4	869.1	869.5	-0.4
M14374	869.3	869.8	-0.5	869.3	869.8	-0.5	869.3	869.8	-0.5
M14520	868.3	868.8	-0.5	868.3	868.8	-0.5	868.3	868.8	-0.5
M14578	870.3	872.0	-1.7	870.3	872.0	-1.7	870.3	872.0	-1.7
M14656	866.8	867.4	-0.6	866.8	867.4	-0.6	866.8	867.4	-0.6
M14695	864.3	859.4	4.9	864.3	859.4	4.9	864.3	859.4	4.9
M14714	866.0	870.3	-4.3	866.0	870.3	-4.3	866.0	870.3	-4.3
M14877	866.5	868.9	-2.4	866.5	868.9	-2.4	866.5	868.9	-2.4
M14899	865.8	866.6	-0.8	865.8	866.6	-0.8	865.8	866.6	-0.8
M15022	863.8	865.9	-2.1	863.8	866.1	-2.3	863.8	865.8	-2.0
M15024	863.9	865.9	-2.0	863.9	866.1	-2.2	863.9	865.8	-1.9
M15026	865.3	866.5	-1.2	865.3	866.5	-1.2	865.3	866.4	-1.1

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
M15027	865.4	866.6	-1.2	865.4	866.6	-1.2	865.4	866.6	-1.2
M15041	867.3	868.3	-1.0	867.3	868.3	-1.0	867.3	868.3	-1.0
M15102	869.3	870.2	-0.9	869.3	870.2	-0.9	869.3	870.2	-0.9
M15104	869.1	870.0	-0.9	869.1	870.0	-0.9	869.1	870.0	-0.9
M15107	868.8	869.8	-1.0	868.8	869.8	-1.0	868.8	869.8	-1.0
M15108	868.7	869.7	-1.0	868.7	869.7	-1.0	868.7	869.7	-1.0
M15112	868.6	869.5	-1.0	868.6	869.5	-1.0	868.6	869.5	-1.0
M15115	868.4	869.5	-1.1	868.4	869.5	-1.1	868.4	869.5	-1.1
M15119	868.3	869.4	-1.1	868.3	869.4	-1.1	868.3	869.4	-1.1
M15123	867.8	869.0	-1.2	867.8	869.0	-1.2	867.8	869.0	-1.2
M15131	867.3	868.5	-1.2	867.3	868.5	-1.2	867.3	868.5	-1.2
MH 2030	827.3	827.5	-0.2	827.3	827.5	-0.2	827.3	824.3	3.0
MH NB 43-3	835.5	821.6	13.9	835.5	821.4	14.0	835.5	821.3	14.1
MH NB 45-1	836.8	823.0	13.7	836.8	822.8	14.0	836.8	822.7	14.0
MH NB 50-1	834.1	826.3	7.8	834.1	826.1	7.9	834.1	826.1	8.0
MH NB 57-1	830.2	831.0	-0.8	830.2	831.0	-0.8	830.2	831.0	-0.8
MH NB 57-4	830.2	831.0	-0.8	830.2	831.0	-0.8	830.2	831.0	-0.8
MH NB 58-3	830.2	831.0	-0.8	830.2	831.0	-0.8	830.2	831.0	-0.8
MH R5 37-1	837.9	838.5	-0.6	837.9	838.5	-0.6	837.9	838.5	-0.6
MH R5 39-1	835.5	835.9	-0.4	835.5	835.8	-0.3	835.5	835.8	-0.3
MH SB 32-2	851.2	849.1	2.1	848.9	849.0	-0.1	848.9	843.0	5.9
MH SB 32-4	846.3	846.6	-0.3	846.8	846.9	-0.1	846.8	841.6	5.2
MH SB 35-1	844.1	844.5	-0.4	848.6	841.4	7.2	848.6	839.4	9.2
MH SB 38-3	845.5	840.9	4.6	855.7	835.4	20.3	855.7	837.1	18.5
MH136	875.9	875.6	0.3	875.9	875.6	0.3	875.9	875.6	0.3
MH140	875.4	875.4	0.0	875.4	875.4	0.0	875.4	875.4	0.0
MH143	875.2	875.3	-0.2	875.2	875.3	-0.2	875.2	875.3	-0.2
MH155A	874.3	874.7	-0.4	874.3	874.7	-0.4	874.3	874.7	-0.4
MH156	874.2	874.7	-0.5	874.2	874.7	-0.5	874.2	874.7	-0.5
MH169	873.3	874.0	-0.6	873.3	874.0	-0.6	873.3	874.0	-0.6
MH17-10-2	827.6	829.0	-1.4	827.6	829.0	-1.4	827.6	829.0	-1.4
MH173	874.2	873.2	0.9	874.2	873.2	0.9	874.2	873.2	0.9
MH178	872.6	873.2	-0.6	872.6	873.2	-0.6	872.6	873.2	-0.6
MH181	872.3	872.9	-0.6	872.3	872.9	-0.6	872.3	872.9	-0.6
MH185	873.1	872.1	1.0	873.1	872.1	1.0	873.1	872.8	0.3
MH187	871.6	872.0	-0.4	871.6	872.0	-0.4	871.6	872.0	-0.4
MH192	871.3	871.7	-0.4	871.3	871.7	-0.4	871.3	871.7	-0.4
MH195	871.0	871.5	-0.5	871.0	871.5	-0.5	871.0	871.5	-0.5
MH5	821.0	823.8	-2.8	821.0	823.8	-2.8	821.0	823.8	-2.8
MH76	853.9	857.4	-3.5	852.9	855.3	-2.4	852.9	854.1	-1.2

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
MH80	854.9	857.4	-2.5	852.7	855.3	-2.5	852.7	854.1	-1.3
MH82	866.5	859.8	6.7	866.5	858.2	8.3	866.5	857.4	9.0
MHHN79-3	829.0	828.0	1.0	829.0	828.0	1.0	829.0	828.0	1.0
MHLN81-3	828.5	829.0	-0.5	828.5	828.9	-0.4	828.5	828.9	-0.4
MHNB188-2	840.1	833.4	6.7	840.1	833.5	6.6	840.1	833.4	6.7
N105	873.3	873.7	-0.4	873.3	873.7	-0.4	873.3	873.7	-0.4
N115	866.8	862.0	4.8	866.8	862.0	4.8	866.8	862.0	4.8
N131	860.9	863.4	-2.5	860.9	863.4	-2.5	860.9	863.4	-2.5
N132	864.8	865.2	-0.4	864.8	865.2	-0.4	864.8	865.2	-0.4
N169	851.8	852.3	-0.5	850.7	851.4	-0.8	850.7	851.3	-0.7
N16989	865.3	866.8	-1.5	865.3	866.8	-1.5	865.3	866.8	-1.5
N16993	865.3	866.8	-1.5	865.3	866.8	-1.5	865.3	866.8	-1.5
N16996	866.3	866.8	-0.5	866.3	866.8	-0.5	866.3	866.8	-0.5
N170	849.9	851.1	-1.2	850.3	851.4	-1.1	850.3	850.7	-0.4
N17001	868.3	866.5	1.8	868.3	866.5	1.8	868.3	866.6	1.7
N17014	868.1	864.1	3.9	868.1	864.1	3.9	868.1	864.1	3.9
N17019	867.8	859.8	8.0	867.8	859.8	8.0	867.8	859.8	8.0
N2075	878.5	878.4	0.1	878.5	878.4	0.1	878.5	878.4	0.1
N2076	878.5	878.3	0.2	878.5	878.3	0.2	878.5	878.3	0.2
N22	887.8	888.3	-0.5	887.8	888.3	-0.5	887.8	888.3	-0.5
N23	887.3	887.6	-0.3	887.3	887.6	-0.3	887.3	887.6	-0.3
N24	886.2	885.7	0.5	886.2	885.6	0.6	886.2	885.7	0.5
N25	867.3	867.9	-0.6	867.3	867.7	-0.4	867.3	867.7	-0.4
N50	881.0	0.0	881.0	881.0	0.0	881.0	881.0	0.0	881.0
N509	878.5	878.7	-0.2	878.5	878.7	-0.2	878.5	878.7	-0.2
N510	878.3	878.6	-0.3	878.3	878.6	-0.3	878.3	878.6	-0.3
N67	853.0	849.5	3.5	853.0	849.5	3.5	853.0	849.5	3.5
N69	857.8	857.2	0.6	857.8	857.2	0.6	857.8	857.2	0.6
NI_RU	871.8	872.2	-0.4	871.8	872.2	-0.4	871.8	872.2	-0.4
Node386	840.4	835.1	5.3	840.4	835.2	5.3	840.4	835.1	5.3
Node387	842.8	832.8	10.0	842.8	833.0	9.8	842.8	832.7	10.1
Node536	#N/A	#N/A	#N/A	850.0	#N/A	#N/A	850.0	850.0	0.0
Node539	#N/A	#N/A	#N/A	861.2	0.0	861.2	861.2	859.1	2.1
Node540	#N/A	#N/A	#N/A	858.2	0.0	858.2	858.2	857.3	0.9
North Pond	#N/A	#N/A	#N/A	849.0	#N/A	#N/A	849.0	849.7	-0.7
NPondIn	#N/A	#N/A	#N/A	848.0	#N/A	#N/A	848.0	849.0	-1.0
O17382	850.6	842.0	8.6	850.6	841.9	8.7	850.6	841.8	8.8
O17590	860.1	860.6	-0.5	860.1	860.6	-0.5	860.1	860.6	-0.5
O17593	864.7	864.9	-0.2	864.7	864.9	-0.2	864.7	864.9	-0.2
O17595	859.8	860.3	-0.5	859.8	860.3	-0.5	859.8	860.3	-0.5

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
O17606	858.8	859.4	-0.6	858.8	859.4	-0.6	858.8	859.4	-0.6
O17608	858.3	858.7	-0.4	858.3	858.7	-0.4	858.3	858.7	-0.4
O17620	857.1	857.6	-0.5	857.1	857.6	-0.5	857.1	857.6	-0.5
O17636	856.8	857.3	-0.5	856.8	857.3	-0.5	856.8	857.3	-0.5
O17675	858.3	858.7	-0.4	858.3	858.7	-0.4	858.3	858.7	-0.4
O17676	858.3	858.6	-0.3	858.3	858.6	-0.3	858.3	858.6	-0.3
O17678	857.3	857.6	-0.3	857.3	857.6	-0.3	857.3	857.6	-0.3
O17695	856.3	844.3	12.0	856.3	844.3	12.0	856.3	844.3	12.0
O17854	856.1	856.6	-0.5	856.1	856.6	-0.5	856.1	856.6	-0.5
O17976	856.0	845.7	10.3	856.0	845.7	10.3	856.0	845.7	10.3
O17980	854.3	854.8	-0.5	854.3	854.8	-0.5	854.3	854.8	-0.5
O17993	854.2	854.8	-0.6	854.2	854.8	-0.6	854.2	854.8	-0.6
O18000	709.3	0.0	709.3	709.3	0.0	709.3	709.3	0.0	709.3
O18007	854.0	854.8	-0.8	854.0	854.8	-0.8	854.0	854.8	-0.8
O18169	856.7	856.9	-0.2	856.7	856.9	-0.2	856.7	856.9	-0.2
O18170	855.8	856.0	-0.2	855.8	856.0	-0.2	855.8	856.0	-0.2
O18174	849.3	853.0	-3.7	849.3	853.0	-3.7	849.3	853.0	-3.7
O18175	853.8	854.0	-0.2	853.8	854.0	-0.2	853.8	854.0	-0.2
O18178	851.8	853.0	-1.2	851.8	853.0	-1.2	851.8	853.0	-1.2
O18181	854.8	849.5	5.3	854.8	849.5	5.3	854.8	849.5	5.3
O18184	851.7	853.0	-1.3	851.7	853.0	-1.3	851.7	853.0	-1.3
O18186	852.3	852.7	-0.4	852.3	852.7	-0.4	852.3	852.7	-0.4
O18187	851.8	853.0	-1.2	851.8	853.0	-1.2	851.8	853.0	-1.2
O18191	855.3	851.3	4.0	855.3	851.3	4.0	855.3	851.3	4.0
O18192	852.3	853.0	-0.7	852.3	853.0	-0.7	852.3	853.0	-0.7
O18193	851.3	853.0	-1.7	851.3	853.0	-1.7	851.3	853.0	-1.7
O18197	855.3	847.6	7.7	855.3	847.7	7.6	855.3	847.6	7.7
O18346	853.9	852.7	1.2	853.9	852.7	1.2	853.9	852.7	1.2
O18370	855.8	850.8	5.0	855.8	850.8	5.0	855.8	850.8	5.0
O18525	851.3	853.0	-1.7	851.3	853.0	-1.7	851.3	853.0	-1.7
O18600	850.0	853.2	-3.2	850.0	853.1	-3.1	850.0	853.2	-3.2
O18601	857.3	853.9	3.4	857.3	853.9	3.4	857.3	853.9	3.4
O18618	855.2	856.5	-1.3	855.2	856.5	-1.3	855.2	856.5	-1.3
O18634	852.7	853.2	-0.5	852.7	853.2	-0.5	852.7	853.2	-0.5
O18777	855.5	855.5	0.0	855.5	855.5	0.0	855.5	855.5	0.0
O18890	855.5	855.6	-0.1	855.5	855.6	-0.1	855.5	855.6	-0.1
O18891	856.8	856.4	0.4	856.8	856.4	0.4	856.8	856.4	0.4
O18894	856.3	856.6	-0.3	856.3	856.6	-0.3	856.3	856.6	-0.3
O18901	856.5	856.9	-0.4	856.5	856.9	-0.4	856.5	856.9	-0.4
O18902	855.3	855.5	-0.2	855.3	855.5	-0.2	855.3	855.5	-0.2

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
O18907	856.3	856.9	-0.6	856.3	856.9	-0.6	856.3	856.9	-0.6
O18910	856.6	856.9	-0.3	856.6	856.9	-0.3	856.6	856.9	-0.3
O18926	857.3	857.4	-0.1	857.3	857.4	-0.1	857.3	857.4	-0.1
O18928	856.7	856.8	-0.1	856.7	856.8	-0.1	856.7	856.8	-0.1
O18929	856.7	856.8	-0.2	856.7	856.8	-0.2	856.7	856.8	-0.2
O18930	859.5	859.8	-0.3	859.5	859.8	-0.3	859.5	859.8	-0.3
O18932	859.5	859.5	0.0	859.5	859.5	0.0	859.5	859.5	0.0
O18936	859.4	859.9	-0.5	859.4	859.9	-0.5	859.4	859.9	-0.5
O18941	861.0	861.1	-0.1	861.0	861.1	-0.1	861.0	861.1	-0.1
O19015	856.3	856.9	-0.6	856.3	856.9	-0.6	856.3	856.9	-0.6
O19212	859.6	860.0	-0.3	859.6	860.0	-0.3	859.6	860.0	-0.3
O19213	856.2	856.3	-0.1	856.2	856.3	-0.1	856.2	856.3	-0.1
O19272	856.7	857.3	-0.6	856.7	857.3	-0.6	856.7	857.3	-0.6
O19355	857.4	857.9	-0.5	857.4	857.9	-0.5	857.4	857.9	-0.5
O19440	858.6	859.0	-0.3	858.6	859.0	-0.3	858.6	859.0	-0.3
O19446	857.4	857.9	-0.5	857.4	857.9	-0.5	857.4	857.9	-0.5
O19452	857.1	857.9	-0.8	857.1	857.9	-0.8	857.1	857.9	-0.8
O19455	858.9	859.2	-0.3	858.9	859.2	-0.3	858.9	859.2	-0.3
OAK OUT1	828.3	827.6	0.6	828.0	827.6	0.4	828.0	827.7	0.3
OAK OUT2	830.0	830.0	0.0	830.0	830.0	0.0	830.0	830.0	0.0
OAK OUT3	833.5	833.7	-0.2	833.5	833.7	-0.2	833.5	833.7	-0.2
OAK OUT4	833.5	833.2	0.3	833.5	833.2	0.3	833.5	833.2	0.3
OAK OUT5	831.5	831.7	-0.2	831.5	831.7	-0.2	831.5	831.7	-0.2
OAK OUT6	831.5	831.3	0.2	831.5	831.3	0.2	831.5	831.3	0.2
OAK OUT7	834.0	833.9	0.1	834.0	833.9	0.1	834.0	833.9	0.1
P16324	870.8	870.9	-0.1	870.8	870.9	-0.1	870.8	870.9	-0.1
P16327	869.8	870.0	-0.1	869.8	870.0	-0.1	869.8	870.0	-0.1
P16380	869.6	869.8	-0.2	869.6	869.8	-0.2	869.6	869.8	-0.2
P16518	869.1	869.1	0.0	869.1	869.1	0.0	869.1	869.1	0.0
P16521	873.3	873.4	-0.1	873.3	873.4	-0.1	873.3	873.4	-0.1
P16533	871.3	871.4	-0.1	871.3	871.4	-0.1	871.3	871.4	-0.1
P16672	868.6	868.9	-0.3	868.6	868.9	-0.3	868.6	868.9	-0.3
P16727	863.4	865.9	-2.6	863.4	865.9	-2.6	863.4	865.9	-2.6
P17018	868.2	868.4	-0.2	868.2	868.4	-0.2	868.2	868.4	-0.2
P17024	866.0	866.2	-0.2	866.0	866.2	-0.2	866.0	866.2	-0.2
P17026	865.8	866.1	-0.3	865.8	866.1	-0.3	865.8	866.1	-0.3
P17032	860.4	861.2	-0.8	860.4	861.2	-0.8	860.4	861.2	-0.8
P17041	860.5	861.2	-0.7	860.5	861.2	-0.7	860.5	861.2	-0.7
P17046	866.0	865.2	0.7	866.0	865.2	0.7	866.0	865.2	0.7
P17051	867.5	867.7	-0.2	867.5	867.7	-0.2	867.5	867.7	-0.2

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
P17061	864.4	865.0	-0.6	864.4	865.0	-0.6	864.4	865.0	-0.6
P17190	864.3	864.8	-0.5	864.3	864.8	-0.5	864.3	864.8	-0.5
P17211	860.5	861.2	-0.7	860.5	861.2	-0.7	860.5	861.2	-0.7
P17272	861.5	864.4	-3.0	861.5	864.4	-3.0	861.5	864.4	-3.0
P17309	861.8	862.7	-0.9	861.8	862.7	-0.9	861.8	862.7	-0.9
P17357	862.6	866.0	-3.4	862.6	866.0	-3.4	862.6	866.0	-3.4
P17432	864.3	866.0	-1.7	864.3	866.0	-1.7	864.3	866.0	-1.7
P17536	857.3	850.5	6.8	857.3	850.5	6.8	857.3	850.3	7.0
P17587	857.3	858.1	-0.8	857.3	858.1	-0.8	857.3	858.1	-0.8
P17682	857.4	858.6	-1.2	857.4	858.6	-1.2	857.4	858.6	-1.2
P17696	857.3	860.6	-3.3	857.3	860.6	-3.3	857.3	860.6	-3.3
P17699	858.8	860.6	-1.8	858.8	860.6	-1.8	858.8	860.6	-1.8
P17702	858.8	860.5	-1.7	858.8	860.5	-1.7	858.8	860.6	-1.8
P17718	859.4	860.9	-1.5	859.4	860.9	-1.5	859.4	860.9	-1.5
P17719	859.8	860.7	-0.9	859.8	860.7	-0.9	859.8	860.7	-0.9
P17720	860.6	861.2	-0.7	860.6	861.2	-0.7	860.6	861.2	-0.7
P17735	861.3	861.7	-0.4	861.3	861.7	-0.4	861.3	861.7	-0.4
P17736	861.3	861.8	-0.5	861.3	861.8	-0.5	861.3	861.8	-0.5
P17745	860.8	862.2	-1.4	860.8	862.2	-1.4	860.8	862.2	-1.4
P17754	871.7	871.8	-0.1	871.7	871.8	-0.1	871.7	871.8	-0.1
P17755	861.6	862.6	-1.1	861.6	862.6	-1.1	861.6	862.6	-1.1
P17772	870.3	870.5	-0.2	870.3	870.5	-0.2	870.3	870.5	-0.2
P17801	862.1	862.7	-0.6	862.1	862.7	-0.6	862.1	862.7	-0.6
P17806	863.7	863.9	-0.1	863.7	863.9	-0.1	863.7	863.9	-0.1
P17813	866.0	866.1	-0.2	866.0	866.1	-0.2	866.0	866.1	-0.2
P17912	861.6	862.7	-1.2	861.6	862.7	-1.2	861.6	862.7	-1.2
P17914	870.0	870.5	-0.5	870.0	870.5	-0.5	870.0	870.5	-0.5
P17950	866.1	866.5	-0.4	866.1	866.5	-0.4	866.1	866.5	-0.4
P17959	861.4	862.2	-0.8	861.4	862.2	-0.8	861.4	862.2	-0.8
P17967	858.3	859.0	-0.7	858.3	859.0	-0.7	858.3	859.0	-0.7
P17987	868.1	868.6	-0.5	868.1	868.6	-0.5	868.1	868.6	-0.5
P17988	862.8	863.9	-1.1	862.8	863.9	-1.1	862.8	863.9	-1.1
P17989	868.0	868.5	-0.5	868.0	868.5	-0.5	868.0	868.5	-0.5
P17996	859.8	860.4	-0.6	859.8	860.4	-0.6	859.8	860.4	-0.6
P18143	861.3	861.9	-0.6	861.3	861.9	-0.6	861.3	861.9	-0.6
P18247	861.4	862.2	-0.8	861.4	862.2	-0.8	861.4	862.2	-0.8
P18255	861.8	862.5	-0.7	861.8	862.5	-0.7	861.8	862.5	-0.7
P18260	862.3	863.0	-0.7	862.3	863.0	-0.7	862.3	863.0	-0.7
P18270	862.4	863.1	-0.7	862.4	863.1	-0.7	862.4	863.1	-0.7
P18338	864.3	865.3	-1.0	864.3	865.3	-1.0	864.3	865.3	-1.0

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
P18354	865.3	865.6	-0.3	865.3	865.6	-0.3	865.3	865.6	-0.3
P18363	865.4	865.6	-0.2	865.4	865.6	-0.2	865.4	865.6	-0.2
P18383	865.8	865.5	0.3	865.8	865.5	0.3	865.8	865.5	0.3
P18391	864.9	865.5	-0.6	864.9	865.5	-0.6	864.9	865.5	-0.6
P18398	864.9	865.8	-0.9	864.9	865.8	-0.9	864.9	865.8	-0.9
P18407	864.4	865.8	-1.4	864.4	865.8	-1.4	864.4	865.8	-1.4
P18411	865.3	866.3	-1.0	865.3	866.3	-1.0	865.3	866.3	-1.0
P18412	865.4	866.5	-1.1	865.4	866.5	-1.1	865.4	866.5	-1.1
P18424	866.3	867.4	-1.1	866.3	867.4	-1.1	866.3	867.4	-1.1
P18426	866.4	867.5	-1.1	866.4	867.5	-1.1	866.4	867.5	-1.1
P18433	866.9	867.9	-1.0	866.9	867.9	-1.0	866.9	867.9	-1.0
P18434	866.8	867.9	-1.1	866.8	867.9	-1.1	866.8	867.9	-1.1
P18440	867.4	868.4	-1.0	867.4	868.4	-1.0	867.4	868.4	-1.0
P18442	867.3	868.4	-1.1	867.3	868.4	-1.1	867.3	868.4	-1.1
P18447	867.4	868.5	-1.1	867.4	868.5	-1.1	867.4	868.5	-1.1
P18448	867.8	868.7	-0.9	867.8	868.7	-0.9	867.8	868.7	-0.9
P18450	868.3	868.9	-0.6	868.3	868.9	-0.6	868.3	869.0	-0.7
P18451	868.4	869.2	-0.8	868.4	869.2	-0.8	868.4	869.2	-0.8
P18454	869.4	870.1	-0.7	869.4	870.1	-0.7	869.4	870.1	-0.7
P18455	869.3	870.0	-0.7	869.3	870.0	-0.7	869.3	870.0	-0.7
P18460	870.4	871.0	-0.6	870.4	871.0	-0.6	870.4	871.0	-0.6
P18461	870.3	870.9	-0.6	870.3	870.9	-0.6	870.3	870.9	-0.6
P18479	862.6	863.2	-0.6	862.6	863.2	-0.6	862.6	863.2	-0.6
P18497	864.3	865.3	-1.0	864.3	865.3	-1.0	864.3	865.3	-1.0
P18503	863.1	863.5	-0.4	863.1	863.5	-0.4	863.1	863.5	-0.4
P18506	864.7	865.0	-0.4	864.7	865.0	-0.4	864.7	865.0	-0.4
P18510	866.6	866.9	-0.3	866.6	866.9	-0.3	866.6	866.9	-0.3
P18589	867.3	867.9	-0.6	867.3	867.9	-0.6	867.3	867.9	-0.6
P18603	864.0	865.0	-1.0	864.0	865.0	-1.0	864.0	865.0	-1.0
P18610	862.3	862.6	-0.3	862.3	862.6	-0.3	862.3	862.6	-0.3
P18653	873.3	870.4	2.9	873.3	870.4	2.9	873.3	870.4	2.9
P18658	871.3	872.6	-1.2	871.3	872.6	-1.2	871.3	872.6	-1.2
P18670	868.3	866.9	1.4	868.3	866.9	1.4	868.3	866.9	1.4
P18671	709.3	0.0	709.3	709.3	0.0	709.3	709.3	0.0	709.3
P18678	863.8	864.1	-0.3	863.8	864.1	-0.3	863.8	864.1	-0.3
P18681	872.3	872.5	-0.2	872.3	872.5	-0.2	872.3	872.5	-0.2
P18699	709.3	0.0	709.3	709.3	0.0	709.3	709.3	0.0	709.3
P18795	867.3	868.2	-0.9	867.3	868.2	-0.9	867.3	868.2	-0.9
P18854	874.3	873.2	1.1	874.3	873.2	1.1	874.3	873.2	1.1
P18882	709.3	0.0	709.3	709.3	0.0	709.3	709.3	0.0	709.3

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
P18943	867.3	868.2	-0.9	867.3	868.2	-0.9	867.3	868.2	-0.9
P18950	865.6	865.9	-0.3	865.6	865.9	-0.3	865.6	865.9	-0.3
P18953	865.9	866.1	-0.2	865.9	866.1	-0.2	865.9	866.1	-0.2
P19003	869.5	869.7	-0.2	869.5	869.7	-0.2	869.5	869.7	-0.2
P19019	866.5	866.7	-0.2	866.5	866.7	-0.2	866.5	866.7	-0.2
P19021	866.6	866.9	-0.3	866.6	866.9	-0.3	866.6	866.9	-0.3
P19051	866.8	867.2	-0.4	866.8	867.2	-0.4	866.8	867.2	-0.4
P19066	866.1	866.3	-0.2	866.1	866.3	-0.2	866.1	866.3	-0.2
P19070	867.3	867.7	-0.4	867.3	867.7	-0.4	867.3	867.7	-0.4
P19092	867.4	868.2	-0.8	867.4	868.2	-0.8	867.4	868.2	-0.8
P19097	870.8	870.9	-0.1	870.8	870.9	-0.1	870.8	870.9	-0.1
P19101	874.3	874.4	-0.1	874.3	874.4	-0.1	874.3	874.4	-0.1
P19131	874.8	874.9	-0.1	874.8	874.9	-0.1	874.8	874.9	-0.1
P19137	874.3	873.9	0.4	874.3	873.9	0.4	874.3	873.9	0.4
P19143	876.1	876.3	-0.2	876.1	876.3	-0.2	876.1	876.3	-0.2
P19144	875.3	875.5	-0.2	875.3	875.5	-0.2	875.3	875.5	-0.2
P19145	875.8	876.0	-0.2	875.8	876.0	-0.2	875.8	876.0	-0.2
P19147	876.6	876.7	-0.1	876.6	876.7	-0.1	876.6	876.7	-0.1
P19148	877.3	877.4	-0.1	877.3	877.4	-0.1	877.3	877.4	-0.1
P19149	876.8	876.9	-0.1	876.8	876.9	-0.1	876.8	876.9	-0.1
P19155	867.8	868.2	-0.4	867.8	868.2	-0.4	867.8	868.2	-0.4
P19214	867.4	868.2	-0.8	867.4	868.2	-0.8	867.4	868.2	-0.8
R1	860.1	861.2	-1.2	860.1	861.2	-1.2	860.1	861.2	-1.2
R113	837.4	839.4	-2.0	837.4	839.4	-2.0	837.4	839.4	-2.0
R12	859.7	859.9	-0.1	859.7	859.9	-0.1	859.7	859.9	-0.1
R124	840.7	841.0	-0.3	840.7	841.0	-0.3	840.7	841.0	-0.3
R126	843.3	843.6	-0.3	843.3	843.6	-0.3	843.3	843.6	-0.3
R127	837.3	839.5	-2.2	837.3	839.5	-2.2	837.3	839.5	-2.2
R128	836.3	839.5	-3.2	836.3	839.5	-3.2	836.3	839.5	-3.2
R13	852.1	852.2	-0.2	852.1	852.2	-0.2	852.1	852.2	-0.2
R130	844.5	844.8	-0.3	844.5	844.8	-0.3	844.5	844.8	-0.3
R132	836.3	839.5	-3.2	836.3	839.5	-3.2	836.3	839.5	-3.2
R134	872.8	856.3	16.5	872.8	856.3	16.5	872.8	856.3	16.5
R136	836.3	839.4	-3.1	836.3	839.5	-3.2	836.3	839.4	-3.1
R139	837.3	839.4	-2.1	837.3	839.4	-2.1	837.3	839.4	-2.1
R14	846.8	846.4	0.4	846.8	846.4	0.4	846.8	846.4	0.4
R140	839.3	839.6	-0.3	839.3	839.6	-0.3	839.3	839.6	-0.3
R141	841.3	841.5	-0.2	841.3	841.5	-0.2	841.3	841.5	-0.2
R142	841.3	841.8	-0.5	841.3	841.8	-0.5	841.3	841.8	-0.5
R143	845.8	845.9	-0.1	845.8	845.9	-0.1	845.8	845.9	-0.1

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
R144	850.3	850.4	-0.1	850.3	850.4	-0.1	850.3	850.4	-0.1
R161	837.3	839.5	-2.2	837.3	839.5	-2.2	837.3	839.5	-2.2
R172	841.1	842.8	-1.7	841.1	842.8	-1.7	841.1	842.8	-1.7
R175	837.8	839.5	-1.7	837.8	839.5	-1.7	837.8	839.5	-1.7
R191	838.7	839.5	-0.8	838.7	839.5	-0.8	838.7	839.5	-0.8
R193	837.9	839.5	-1.6	837.9	839.5	-1.6	837.9	839.5	-1.6
R194	837.3	839.5	-2.2	837.3	839.5	-2.2	837.3	839.5	-2.2
R195	838.7	839.5	-0.8	838.7	839.5	-0.8	838.7	839.5	-0.8
R196	837.9	839.5	-1.6	837.9	839.5	-1.6	837.9	839.5	-1.6
R197	852.8	853.0	-0.2	852.8	853.0	-0.2	852.8	853.0	-0.2
R198	838.1	839.5	-1.4	838.1	839.5	-1.4	838.1	839.5	-1.4
R199	849.8	850.0	-0.2	849.8	850.0	-0.2	849.8	850.0	-0.2
R200	844.9	842.8	2.1	844.9	842.8	2.1	844.9	842.8	2.1
R201	838.3	839.5	-1.2	838.3	839.5	-1.2	838.3	839.5	-1.2
R202	838.3	839.5	-1.2	838.3	839.5	-1.2	838.3	839.5	-1.2
R205	842.4	842.5	-0.2	842.4	842.5	-0.2	842.4	842.5	-0.2
R206	846.3	846.5	-0.2	846.3	846.5	-0.2	846.3	846.5	-0.2
R231	838.0	839.5	-1.5	838.0	839.5	-1.5	838.0	839.5	-1.5
R232	838.0	839.5	-1.5	838.0	839.5	-1.5	838.0	839.5	-1.5
R233	839.8	841.3	-1.5	839.8	841.3	-1.5	839.8	841.3	-1.5
R234	840.3	841.3	-1.0	840.3	841.3	-1.0	840.3	841.3	-1.0
R242	839.1	839.8	-0.7	839.1	839.8	-0.7	839.1	839.8	-0.7
R254	839.1	839.8	-0.7	839.1	839.8	-0.7	839.1	839.8	-0.7
R255	840.2	840.3	-0.1	840.2	840.3	-0.1	840.2	840.3	-0.1
R258	855.3	855.5	-0.2	855.3	855.5	-0.2	855.3	855.5	-0.2
R259	853.2	853.5	-0.3	853.2	853.5	-0.3	853.2	853.5	-0.3
R260	851.3	852.0	-0.7	851.3	852.0	-0.7	851.3	852.0	-0.7
R261	840.7	841.1	-0.4	840.7	841.1	-0.4	840.7	841.1	-0.4
R262	851.3	851.9	-0.6	851.3	851.9	-0.6	851.3	851.9	-0.6
R263	840.3	841.1	-0.8	840.3	841.1	-0.8	840.3	841.1	-0.8
R264	851.3	851.6	-0.3	851.3	851.6	-0.3	851.3	851.6	-0.3
R265	846.6	846.9	-0.3	846.6	846.9	-0.3	846.6	846.9	-0.3
R266	841.3	841.9	-0.6	841.3	841.9	-0.6	841.3	841.9	-0.6
R267	839.2	839.8	-0.6	839.2	839.8	-0.6	839.2	839.8	-0.6
R268	840.9	841.3	-0.4	840.9	841.3	-0.4	840.9	841.3	-0.4
R33	845.9	845.9	0.0	845.9	845.9	0.0	845.9	845.9	0.0
R43	851.0	843.2	7.8	851.0	843.2	7.8	851.0	843.2	7.8
R48	840.0	840.4	-0.4	840.0	840.4	-0.4	840.0	840.4	-0.4
R49	858.3	857.1	1.2	858.3	857.1	1.2	858.3	857.1	1.2
R50	854.7	855.0	-0.3	854.7	855.0	-0.3	854.7	855.0	-0.3

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
R51	858.3	857.2	1.1	858.3	857.2	1.1	858.3	857.2	1.1
R52	854.7	854.1	0.6	854.7	854.1	0.6	854.7	854.1	0.6
R53	857.3	857.0	0.3	857.3	857.0	0.3	857.3	857.0	0.3
R54	834.3	838.1	-3.8	834.3	838.1	-3.8	834.3	838.1	-3.8
R56	847.8	848.1	-0.3	847.8	848.1	-0.3	847.8	848.1	-0.3
R57	847.3	847.5	-0.2	847.3	847.5	-0.2	847.3	847.5	-0.2
R58	840.5	840.4	0.1	840.5	840.4	0.1	840.5	840.4	0.1
R6	860.6	860.7	-0.2	860.6	860.7	-0.2	860.6	860.7	-0.2
R60	845.7	844.8	0.9	845.7	844.8	0.9	845.7	844.8	0.9
R61	844.3	843.1	1.2	844.3	843.1	1.2	844.3	843.2	1.1
R69	845.3	839.2	6.1	845.3	839.2	6.1	845.3	839.2	6.1
R7	863.4	860.9	2.5	863.4	860.9	2.5	863.4	860.9	2.5
R70	852.3	839.0	13.3	852.3	839.0	13.3	852.3	839.1	13.2
R72	852.3	838.9	13.4	852.3	838.9	13.4	852.3	838.9	13.4
R77	844.3	839.4	4.9	844.3	839.3	5.0	844.3	839.4	4.9
R78	839.7	840.4	-0.7	839.7	840.4	-0.7	839.7	840.4	-0.7
R8	860.8	861.1	-0.3	860.8	861.1	-0.3	860.8	861.1	-0.3
R81	839.7	840.3	-0.6	839.7	840.3	-0.6	839.7	840.3	-0.6
R82	838.5	838.1	0.4	838.5	838.1	0.4	838.5	838.1	0.4
R83	839.7	840.1	-0.3	839.7	840.1	-0.3	839.7	840.1	-0.3
R86	838.5	838.1	0.4	838.5	838.1	0.4	838.5	838.1	0.4
R89	839.3	838.1	1.2	839.3	838.1	1.2	839.3	838.1	1.2
R9	861.0	860.5	0.5	861.0	860.5	0.5	861.0	860.5	0.5
R90	839.6	838.1	1.5	839.6	838.1	1.5	839.6	838.5	1.1
R93	839.6	842.0	-2.4	839.6	842.0	-2.4	839.6	842.0	-2.4
R94	838.8	839.4	-0.6	838.8	839.4	-0.6	838.8	839.4	-0.6
R95	842.0	844.4	-2.4	842.0	844.4	-2.4	842.0	844.4	-2.4
RIVER	750.5	739.4	11.1	750.5	739.4	11.1	750.5	739.4	11.1
RU	890.5	892.8	-2.3	890.5	892.8	-2.3	890.5	892.8	-2.3
RU_WE	895.0	890.5	4.5	895.0	890.5	4.5	895.0	890.5	4.5
SAN SEWER	846.5	845.2	1.3	846.5	845.2	1.3	846.5	845.2	1.3
SouthPondA	#N/A	#N/A	#N/A	864.0	0.0	864.0	864.0	862.0	2.0
SouthPondB	#N/A	#N/A	#N/A	861.0	0.0	861.0	861.0	859.1	1.9
ST_49 F	862.3	861.8	0.5	862.3	861.8	0.5	862.3	861.8	0.5
ST_RU	850.8	854.8	-4.0	850.8	854.9	-4.1	850.8	854.8	-4.0
T19194	875.3	875.4	-0.1	875.3	875.4	-0.1	875.3	875.4	-0.1
T19249	875.1	875.2	-0.1	875.1	875.2	-0.1	875.1	875.2	-0.1
T19290	868.1	866.4	1.6	868.1	866.4	1.6	868.1	866.4	1.6
T19291	866.3	867.5	-1.2	866.3	867.5	-1.2	866.3	867.5	-1.2
T19295	865.9	865.7	0.2	865.9	865.7	0.2	865.9	865.7	0.2

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
T19298	874.8	875.0	-0.2	874.8	875.0	-0.2	874.8	875.0	-0.2
T19316	875.8	876.0	-0.2	875.8	876.0	-0.2	875.8	876.0	-0.2
T19437	865.5	865.5	0.0	865.5	865.5	0.0	865.5	865.5	0.0
T19491	865.3	865.4	-0.1	865.3	865.4	-0.1	865.3	865.4	-0.1
T19495	865.8	865.8	0.0	865.8	865.8	0.0	865.8	865.8	0.0
T19507	866.1	866.3	-0.2	866.1	866.3	-0.2	866.1	866.3	-0.2
T19510	866.3	866.3	0.0	866.3	866.3	0.0	866.3	866.3	0.0
T19511	865.8	866.0	-0.2	865.8	866.0	-0.2	865.8	866.0	-0.2
T19513	865.3	865.6	-0.3	865.3	865.6	-0.3	865.3	865.6	-0.3
T19638	860.7	861.2	-0.5	860.7	861.2	-0.5	860.7	861.2	-0.5
T19641	869.1	868.6	0.5	869.1	868.6	0.5	869.1	868.6	0.5
T19643	869.2	869.8	-0.6	869.2	869.8	-0.6	869.2	869.8	-0.6
T19666	870.1	870.9	-0.8	870.1	870.9	-0.8	870.1	870.9	-0.8
T19672	870.3	871.3	-1.0	870.3	871.3	-1.0	870.3	871.3	-1.0
T19678	870.3	871.4	-1.1	870.3	871.4	-1.1	870.3	871.4	-1.1
T19695	871.3	872.2	-0.9	871.3	872.2	-0.9	871.3	872.2	-0.9
T19696	871.4	872.3	-0.9	871.4	872.3	-0.9	871.4	872.3	-0.9
T19701	872.3	873.1	-0.8	872.3	873.1	-0.8	872.3	873.1	-0.8
T19703	872.4	873.2	-0.8	872.4	873.2	-0.8	872.4	873.2	-0.8
T19704	873.3	874.0	-0.7	873.3	874.0	-0.7	873.3	874.0	-0.7
T19705	873.3	874.2	-0.9	873.3	874.2	-0.9	873.3	874.2	-0.9
T19708	873.8	874.6	-0.8	873.8	874.6	-0.8	873.8	874.6	-0.8
T19709	875.3	875.6	-0.3	875.3	875.6	-0.3	875.3	875.6	-0.3
T19710	873.8	874.7	-0.9	873.8	874.7	-0.9	873.8	874.7	-0.9
T19712	873.8	874.7	-0.9	873.8	874.7	-0.9	873.8	874.7	-0.9
T19713	875.1	875.6	-0.5	875.1	875.6	-0.5	875.1	875.6	-0.5
T19714	875.3	875.7	-0.4	875.3	875.7	-0.4	875.3	875.7	-0.4
T19715	874.3	875.0	-0.7	874.3	875.0	-0.7	874.3	875.0	-0.7
T19716	874.8	875.5	-0.7	874.8	875.5	-0.7	874.8	875.5	-0.7
T19717	874.8	875.4	-0.6	874.8	875.4	-0.6	874.8	875.4	-0.6
T19718	874.6	874.9	-0.3	874.6	874.9	-0.3	874.6	874.9	-0.3
T19811	865.3	864.3	1.0	865.3	864.3	1.0	865.3	864.3	1.0
T19825	860.1	860.7	-0.5	860.1	860.7	-0.5	860.1	860.7	-0.5
T19855	859.6	860.1	-0.5	859.6	860.1	-0.5	859.6	860.1	-0.5
T19878	862.3	862.5	-0.3	862.3	862.5	-0.3	862.3	862.5	-0.3
T19885	866.1	861.8	4.2	866.1	861.8	4.2	866.1	861.8	4.2
T19909	862.6	862.3	0.2	862.6	862.3	0.2	862.6	862.3	0.2
T19918	855.5	858.0	-2.6	855.5	858.0	-2.6	855.5	858.0	-2.6
T19940	865.1	859.2	5.8	865.1	859.2	5.8	865.1	859.2	5.8
T19946	869.7	871.8	-2.1	869.7	871.8	-2.1	869.7	871.8	-2.1

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
T19950	863.1	862.2	0.8	863.1	862.2	0.8	863.1	862.2	0.8
T20163	863.3	856.8	6.5	863.3	856.8	6.5	863.3	856.8	6.5
T20349	850.1	850.4	-0.3	850.1	850.4	-0.3	850.1	850.4	-0.3
T20353	850.2	848.3	1.9	850.2	848.3	1.9	850.2	848.3	1.9
T20357	850.1	850.8	-0.7	850.1	850.8	-0.7	850.1	850.8	-0.7
T20358	850.0	849.3	0.7	850.0	849.3	0.7	850.0	849.3	0.7
T20375	857.6	858.4	-0.8	857.6	858.4	-0.8	857.6	858.4	-0.8
T20405	853.1	852.5	0.6	853.1	852.5	0.6	853.1	852.5	0.6
T20429	861.6	862.2	-0.6	861.6	862.2	-0.6	861.6	862.2	-0.6
T20452	865.8	866.8	-1.0	865.8	866.8	-1.0	865.8	866.8	-1.0
T20454	865.6	866.3	-0.6	865.6	866.3	-0.6	865.6	866.3	-0.6
T20459	856.6	854.9	1.6	856.6	854.9	1.6	856.6	854.9	1.6
T20461	870.1	870.7	-0.6	870.1	870.7	-0.6	870.1	870.7	-0.6
T20463	870.6	871.2	-0.6	870.6	871.2	-0.6	870.6	871.2	-0.6
T20465	871.1	871.8	-0.7	871.1	871.8	-0.7	871.1	871.8	-0.7
T20466	870.9	871.8	-0.9	870.9	871.8	-0.9	870.9	871.8	-0.9
T20468	863.3	840.1	23.2	863.3	840.0	23.3	863.3	840.1	23.2
T20470	857.3	856.5	0.8	857.3	856.5	0.8	857.3	856.5	0.8
T20473	853.6	845.6	8.0	853.6	845.6	8.0	853.6	845.6	8.0
T20476	851.5	847.0	4.5	851.5	847.0	4.5	851.5	847.0	4.5
T20477	857.3	857.0	0.3	857.3	857.0	0.3	857.3	857.0	0.3
T20481	871.3	872.1	-0.8	871.3	872.1	-0.8	871.3	872.1	-0.8
T20483	871.1	872.1	-1.0	871.1	872.1	-1.0	871.1	872.1	-1.0
T20498	873.0	873.6	-0.6	873.0	873.6	-0.6	873.0	873.6	-0.6
T20499	873.1	873.8	-0.7	873.1	873.8	-0.7	873.1	873.8	-0.7
T20507	874.8	875.4	-0.6	874.8	875.4	-0.6	874.8	875.4	-0.6
T20511	874.8	875.6	-0.8	874.8	875.6	-0.8	874.8	875.6	-0.8
T20520	873.4	874.2	-0.8	873.4	874.2	-0.8	873.4	874.2	-0.8
T20524	875.8	876.3	-0.5	875.8	876.3	-0.5	875.8	876.3	-0.5
T20530	873.3	874.2	-0.9	873.3	874.2	-0.9	873.3	874.2	-0.9
T20531	875.8	876.4	-0.6	875.8	876.4	-0.6	875.8	876.4	-0.6
T20551	877.1	877.4	-0.3	877.1	877.4	-0.3	877.1	877.4	-0.3
T20568	852.4	852.2	0.2	852.4	852.2	0.2	852.4	852.2	0.2
T20621	870.8	871.8	-1.0	870.8	871.8	-1.0	870.8	871.8	-1.0
T20640	865.7	866.2	-0.4	865.7	866.2	-0.4	865.7	866.2	-0.4
T20706	865.1	865.6	-0.5	865.1	865.6	-0.5	865.1	865.6	-0.5
T20713	865.3	865.7	-0.4	865.3	865.7	-0.4	865.3	865.7	-0.4
T20714	865.3	865.9	-0.6	865.3	865.9	-0.6	865.3	865.9	-0.6
T20738	848.2	851.7	-3.5	848.2	851.7	-3.5	848.2	851.7	-3.5
T20751	856.3	856.5	-0.2	856.3	856.5	-0.2	856.3	856.5	-0.2

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
T20761	868.3	871.8	-3.5	868.3	871.8	-3.5	868.3	871.8	-3.5
T20831	874.0	875.9	-1.9	874.0	875.9	-1.9	874.0	875.9	-1.9
T21001	855.3	856.1	-0.8	855.3	856.1	-0.8	855.3	856.1	-0.8
T21152	858.3	858.7	-0.4	858.3	858.7	-0.4	858.3	858.7	-0.4
T21168	855.8	856.4	-0.6	855.8	856.4	-0.6	855.8	856.4	-0.6
T21175	862.3	862.8	-0.5	862.3	862.8	-0.5	862.3	862.8	-0.5
T21176	862.1	862.6	-0.5	862.1	862.6	-0.5	862.1	862.6	-0.5
T21199	865.3	865.5	-0.2	865.3	865.5	-0.2	865.3	865.5	-0.2
T21206	871.9	871.4	0.5	871.9	871.4	0.5	871.9	871.4	0.5
T21261	872.0	872.4	-0.4	872.0	872.4	-0.4	872.0	872.4	-0.4
T21262	872.1	872.5	-0.5	872.1	872.5	-0.5	872.1	872.5	-0.5
T21280	873.8	873.4	0.4	873.8	873.4	0.4	873.8	873.4	0.4
T21281	872.9	873.5	-0.6	872.9	873.5	-0.6	872.9	873.5	-0.6
T21290	874.8	875.3	-0.5	874.8	875.3	-0.5	874.8	875.3	-0.5
T21291	874.7	875.2	-0.5	874.7	875.2	-0.5	874.7	875.2	-0.5
T21293	875.5	875.9	-0.5	875.5	875.9	-0.5	875.5	875.9	-0.5
T21296	893.3	893.5	-0.2	893.3	893.5	-0.2	893.3	893.5	-0.2
T21298	883.6	883.8	-0.3	883.6	883.8	-0.3	883.6	883.8	-0.3
T21299	883.3	883.7	-0.4	883.3	883.7	-0.4	883.3	883.7	-0.4
T21300	884.3	884.5	-0.2	884.3	884.5	-0.2	884.3	884.5	-0.2
T21305	876.3	876.8	-0.5	876.3	876.8	-0.5	876.3	876.8	-0.5
T21308	876.5	876.9	-0.3	876.5	876.9	-0.3	876.5	876.9	-0.3
T21311	883.0	883.5	-0.5	883.0	883.5	-0.5	883.0	883.5	-0.5
T21320	883.2	883.5	-0.2	883.2	883.5	-0.2	883.2	883.5	-0.2
T21322	882.8	883.5	-0.7	882.8	883.5	-0.7	882.8	883.5	-0.7
T21359	871.8	872.5	-0.7	871.8	872.5	-0.7	871.8	872.5	-0.7
T21439	877.3	874.9	2.4	877.3	875.0	2.3	877.3	875.0	2.3
T21890	878.3	877.0	1.3	878.3	877.0	1.3	878.3	877.0	1.3
T22070	877.3	878.4	-1.1	877.3	878.4	-1.1	877.3	878.4	-1.1
T22072	877.3	878.4	-1.1	877.3	878.4	-1.1	877.3	878.4	-1.1
T22077	884.3	884.5	-0.2	884.3	884.5	-0.2	884.3	884.5	-0.2
T22082	887.3	887.5	-0.2	887.3	887.5	-0.2	887.3	887.5	-0.2
T22083	890.3	890.5	-0.2	890.3	890.5	-0.2	890.3	890.5	-0.2
T22087	890.3	890.5	-0.2	890.3	890.5	-0.2	890.3	890.5	-0.2
T22090	891.3	891.4	-0.1	891.3	891.4	-0.1	891.3	891.4	-0.1
T22096	878.3	877.5	0.8	878.3	877.5	0.8	878.3	877.5	0.8
T22233	882.5	882.8	-0.3	882.5	882.8	-0.3	882.5	882.8	-0.3
T22263	875.0	878.0	-3.0	875.0	878.0	-3.0	875.0	878.0	-3.0
T22683	879.3	878.0	1.3	879.3	878.0	1.3	879.3	878.0	1.3
T22803	879.6	878.2	1.4	879.6	878.2	1.4	879.6	878.2	1.4

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
T22808	878.3	878.5	-0.2	878.3	878.5	-0.2	878.3	878.5	-0.2
T22812	878.3	878.7	-0.4	878.3	878.7	-0.4	878.3	878.7	-0.4
T22820	879.3	879.5	-0.2	879.3	879.5	-0.2	879.3	879.5	-0.2
T22820.1	878.7	878.9	-0.2	878.7	878.9	-0.2	878.7	878.9	-0.2
T22824	880.1	880.5	-0.4	880.1	880.5	-0.4	880.1	880.5	-0.4
T22846	885.8	881.5	4.3	885.8	881.5	4.3	885.8	881.5	4.3
T22892	879.3	879.5	-0.2	879.3	879.5	-0.2	879.3	879.5	-0.2
T22929	875.8	875.6	0.2	875.8	875.6	0.2	875.8	875.6	0.2
T22962	875.8	875.3	0.5	875.8	875.3	0.5	875.8	875.3	0.5
T23434	879.3	879.7	-0.4	879.3	879.7	-0.4	879.3	879.7	-0.4
T23544	878.3	878.7	-0.4	878.3	878.7	-0.4	878.3	878.7	-0.4
T23563	877.3	877.7	-0.4	877.3	877.7	-0.4	877.3	877.7	-0.4
T23565	877.3	877.8	-0.5	877.3	877.8	-0.5	877.3	877.8	-0.5
T23647	879.3	879.7	-0.4	879.3	879.7	-0.4	879.3	879.7	-0.4
T23752	881.3	880.3	1.0	881.3	880.3	1.0	881.3	880.3	1.0
T23794	877.7	880.3	-2.6	877.7	880.3	-2.6	877.7	880.3	-2.6
T24261	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0
T24284	882.3	882.3	0.0	882.3	882.3	0.0	882.3	882.3	0.0
T24287	883.1	883.1	-0.1	883.1	883.1	-0.1	883.1	883.1	-0.1
T24297	881.3	881.5	-0.2	881.3	881.5	-0.2	881.3	881.5	-0.2
T24301	-1.0	0.0	-1.0	-1.0	0.0	-1.0	-1.0	0.0	-1.0
T24319	883.3	883.4	-0.1	883.3	883.4	-0.1	883.3	883.4	-0.1
T24331	881.3	881.5	-0.2	881.3	881.5	-0.2	881.3	881.5	-0.2
T24339	886.3	880.9	5.4	886.3	880.9	5.4	886.3	880.9	5.4
T99991	860.0	846.8	13.2	860.0	846.8	13.2	860.0	846.8	13.2
T99992	847.0	849.5	-2.5	847.0	849.5	-2.5	847.0	849.5	-2.5
TorAdd	853.3	853.9	-0.6	853.3	853.9	-0.6	853.3	853.9	-0.6
TRANS	819.3	823.5	-4.2	819.3	823.5	-4.2	819.3	823.5	-4.2
U20747	845.0	845.3	-0.3	845.0	845.3	-0.3	845.0	845.3	-0.3
U20790	844.2	844.5	-0.3	844.2	844.5	-0.3	844.2	844.5	-0.3
U20795	840.7	844.0	-3.3	840.7	844.0	-3.3	840.7	844.0	-3.3
U20984	843.8	844.3	-0.5	843.8	844.3	-0.5	843.8	844.3	-0.5
U21092	847.8	840.2	7.6	847.8	840.2	7.6	847.8	840.1	7.7
U21117	841.6	843.9	-2.3	841.6	843.9	-2.3	841.6	843.9	-2.2
U21122	843.5	844.3	-0.8	843.5	844.3	-0.8	843.5	844.3	-0.8
U21136	839.8	843.9	-4.1	839.8	843.9	-4.1	839.8	843.9	-4.1
U21145	846.8	841.3	5.5	846.8	841.2	5.6	846.8	841.2	5.6
U21149	839.3	843.8	-4.5	839.3	843.8	-4.5	839.3	843.8	-4.5
U21211	843.7	844.6	-0.9	843.7	844.6	-0.9	843.7	844.6	-0.9
U21226	843.6	844.7	-1.1	843.6	844.7	-1.1	843.6	844.7	-1.1

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
U21230	849.0	849.8	-0.8	849.0	849.8	-0.8	849.0	849.8	-0.8
U21428	847.4	847.8	-0.4	847.4	847.8	-0.4	847.4	847.8	-0.4
U21729	849.5	849.9	-0.4	849.5	849.9	-0.4	849.5	849.9	-0.4
U21809	849.0	849.3	-0.3	849.0	849.3	-0.3	849.0	849.3	-0.3
U21866	850.5	849.6	0.8	850.5	849.6	0.8	850.5	849.6	0.8
U21949	850.2	850.6	-0.4	850.2	850.6	-0.4	850.2	850.6	-0.4
U21973	869.3	869.5	-0.2	869.3	869.5	-0.2	869.3	869.5	-0.2
U22005	882.3	882.4	-0.1	882.3	882.4	-0.1	882.3	882.4	-0.1
U22150	851.2	850.1	1.1	851.2	850.1	1.1	851.2	850.1	1.1
U22187	845.9	846.2	-0.3	845.9	846.2	-0.3	845.9	846.2	-0.3
U22192	847.8	850.8	-3.0	847.8	850.8	-3.0	847.8	850.8	-3.0
U22413	843.8	839.3	4.5	843.8	839.3	4.5	843.8	839.3	4.5
U22485	839.1	843.8	-4.7	839.1	843.8	-4.7	839.1	843.8	-4.7
U22511	844.3	843.5	0.8	844.3	843.5	0.8	844.3	843.5	0.8
U22515	850.3	850.5	-0.2	850.3	850.5	-0.2	850.3	850.5	-0.2
U22530	847.3	847.5	-0.2	847.3	847.5	-0.2	847.3	847.5	-0.2
U22569	838.8	843.8	-5.0	838.8	843.7	-5.0	838.8	843.8	-5.0
U22577	839.3	843.8	-4.5	839.3	843.7	-4.4	839.3	843.8	-4.5
U22580	853.2	853.2	0.0	853.2	853.2	0.0	853.2	853.2	0.0
U22587	840.3	843.8	-3.5	840.3	843.8	-3.5	840.3	843.8	-3.5
U22606	864.3	864.4	-0.1	864.3	864.4	-0.1	864.3	864.4	-0.1
U22634	873.8	874.1	-0.3	873.8	874.1	-0.3	873.8	874.1	-0.3
U22749	876.3	876.5	-0.2	876.3	876.5	-0.2	876.3	876.5	-0.2
U22817	873.8	874.1	-0.3	873.8	874.1	-0.3	873.8	874.1	-0.3
U22936	866.3	866.9	-0.6	866.3	866.9	-0.6	866.3	866.9	-0.6
U22941	870.3	870.6	-0.3	870.3	870.6	-0.3	870.3	870.6	-0.3
U22942	869.6	869.9	-0.3	869.6	869.9	-0.3	869.6	869.9	-0.3
U22980	865.8	866.4	-0.6	865.8	866.4	-0.6	865.8	866.4	-0.6
U22986	866.3	866.6	-0.3	866.3	866.6	-0.3	866.3	866.6	-0.3
U22990	868.9	869.0	-0.1	868.9	869.0	-0.1	868.9	869.0	-0.1
U22992	864.1	868.4	-4.3	864.1	868.4	-4.3	864.1	868.4	-4.3
U23200	839.1	832.6	6.5	839.1	832.9	6.2	839.1	832.6	6.5
U23424	840.3	838.9	1.4	840.3	838.9	1.4	840.3	838.9	1.4
U23429	840.3	840.8	-0.5	840.3	840.8	-0.5	840.3	840.8	-0.5
U23436	844.8	845.1	-0.3	844.8	845.1	-0.3	844.8	845.1	-0.3
U23442-1	849.3	849.6	-0.3	849.3	849.6	-0.3	849.3	849.6	-0.3
U23442-2	850.0	854.2	-4.2	850.0	854.2	-4.2	850.0	854.2	-4.2
U23445	854.3	854.6	-0.3	854.3	854.6	-0.3	854.3	854.6	-0.3
U23449	859.3	859.8	-0.5	859.3	859.8	-0.5	859.3	859.8	-0.5
U23450	859.3	859.5	-0.2	859.3	859.5	-0.2	859.3	859.5	-0.2

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
U23453	859.3	859.9	-0.6	859.3	859.9	-0.6	859.3	859.9	-0.6
U23456	859.3	860.2	-0.9	859.3	860.2	-0.9	859.3	860.2	-0.9
U23458	859.8	860.4	-0.6	859.8	860.4	-0.6	859.8	860.4	-0.6
U23468	861.3	861.9	-0.6	861.3	861.9	-0.6	861.3	861.9	-0.6
U23480	863.3	863.9	-0.6	863.3	863.9	-0.6	863.3	863.9	-0.6
U23482	863.4	864.2	-0.8	863.4	864.2	-0.8	863.4	864.2	-0.8
U23496	863.8	864.7	-0.9	863.8	864.7	-0.9	863.8	864.7	-0.9
U23501	864.7	865.3	-0.6	864.7	865.3	-0.6	864.7	865.3	-0.6
U23502	864.6	865.5	-0.9	864.6	865.5	-0.9	864.6	865.5	-0.9
U23512	864.7	865.8	-1.1	864.7	865.8	-1.1	864.7	865.8	-1.1
U23515	864.8	865.8	-1.0	864.8	865.8	-1.0	864.8	865.8	-1.0
U23526	865.3	866.3	-1.0	865.3	866.3	-1.0	865.3	866.3	-1.0
U23527	865.3	866.3	-1.0	865.3	866.3	-1.0	865.3	866.3	-1.0
U23533	868.3	868.3	0.0	868.3	868.3	0.0	868.3	868.3	0.0
U23537	869.3	869.9	-0.6	869.3	869.9	-0.6	869.3	869.9	-0.6
U23539	870.8	870.8	0.0	870.8	870.8	0.0	870.8	870.8	0.0
U23597	864.6	864.8	-0.2	864.6	864.8	-0.2	864.6	864.8	-0.2
U23733-1	862.1	862.2	-0.1	862.6	862.2	0.4	862.6	862.2	0.4
U23733-2	863.0	863.3	-0.3	863.0	863.3	-0.3	863.0	863.3	-0.3
U23765	854.5	858.8	-4.4	854.5	858.8	-4.4	854.5	858.8	-4.4
U23790	854.3	854.8	-0.5	854.3	854.8	-0.5	854.3	854.8	-0.5
U23819	864.8	864.2	0.6	864.8	864.2	0.6	864.8	864.2	0.6
U23888	852.9	835.7	17.2	852.9	836.1	16.8	852.9	835.7	17.2
U24078	854.4	854.3	0.1	854.4	854.3	0.1	854.4	854.3	0.1
U24098	864.3	864.2	0.1	864.3	864.2	0.1	864.3	864.2	0.1
U24127	854.3	846.4	7.9	854.3	846.4	7.9	854.3	846.4	7.9
U24145	854.6	854.2	0.4	854.6	854.1	0.4	854.6	854.2	0.4
U24159	854.8	855.2	-0.4	854.8	855.2	-0.4	854.8	855.2	-0.4
U24161	854.8	855.2	-0.4	854.8	855.2	-0.4	854.8	855.2	-0.4
U24164	854.9	855.5	-0.6	854.9	855.5	-0.6	854.9	855.5	-0.6
U24165	854.8	855.2	-0.4	854.8	855.2	-0.4	854.8	855.2	-0.4
U24176	854.9	855.7	-0.9	854.9	855.7	-0.8	854.9	855.7	-0.8
U24190	855.3	855.8	-0.5	855.3	855.8	-0.5	855.3	855.8	-0.5
U24191	855.1	855.9	-0.8	855.1	855.9	-0.8	855.1	855.9	-0.8
U24201	855.3	856.3	-1.0	855.3	856.3	-1.0	855.3	856.3	-1.0
U24206-1	858.3	858.9	-0.6	858.3	858.9	-0.6	858.3	858.9	-0.6
U24206-2	864.5	864.7	-0.2	864.5	864.7	-0.2	864.5	864.7	-0.2
U24211	858.8	859.0	-0.2	858.8	859.0	-0.2	858.8	859.0	-0.2
U24220	863.9	864.2	-0.3	863.9	864.2	-0.3	863.9	864.2	-0.3
U24237	868.3	868.6	-0.3	868.3	868.6	-0.3	868.3	868.6	-0.3

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
U24252	888.3	885.7	2.6	888.3	885.6	2.7	888.3	885.7	2.6
U24254	888.3	888.4	-0.1	888.3	888.4	-0.1	888.3	888.4	-0.1
U24461	877.5	877.2	0.3	877.5	877.2	0.3	877.5	877.2	0.3
U24515	877.3	877.1	0.1	877.3	877.1	0.1	877.3	877.1	0.1
U24771	852.4	842.4	10.0	852.4	842.5	9.9	852.4	842.4	10.0
U24775	852.3	845.9	6.4	852.3	846.0	6.3	852.3	845.9	6.4
U24779	852.3	844.4	7.9	852.3	844.4	7.9	852.3	844.4	7.9
U24784	847.3	850.3	-3.0	847.3	850.3	-3.0	847.3	850.3	-3.0
U24793	846.3	850.3	-4.0	846.3	850.3	-4.0	846.3	850.3	-4.0
U24794	848.0	850.3	-2.3	848.0	850.3	-2.3	848.0	850.3	-2.3
U24797	849.8	850.5	-0.7	849.8	850.5	-0.7	849.8	850.5	-0.7
U24805	853.3	854.0	-0.7	853.3	854.0	-0.7	853.3	854.0	-0.7
U24811	853.3	854.4	-1.1	853.3	854.4	-1.1	853.3	854.4	-1.1
U24812	853.8	854.4	-0.6	853.8	854.4	-0.6	853.8	854.4	-0.6
U24816	853.3	854.4	-1.1	853.3	854.4	-1.1	853.3	854.4	-1.1
U24817	853.3	854.4	-1.1	853.3	854.4	-1.1	853.3	854.4	-1.1
U24819	854.3	854.6	-0.3	854.3	854.6	-0.3	854.3	854.6	-0.3
U24824	856.8	857.1	-0.3	856.8	857.1	-0.3	856.8	857.1	-0.3
U24837	860.3	860.6	-0.3	860.3	860.6	-0.3	860.3	860.6	-0.3
U24845	852.3	844.9	7.4	852.3	845.0	7.3	852.3	844.9	7.4
U24856	847.3	850.3	-3.0	847.3	850.3	-3.0	847.3	850.3	-3.0
U24864	848.0	850.3	-2.3	848.0	850.3	-2.3	848.0	850.3	-2.3
U24869	884.8	877.0	7.8	884.8	877.0	7.8	884.8	877.0	7.8
U24871	875.8	876.6	-0.8	875.8	876.6	-0.8	875.8	876.6	-0.8
U24874	876.3	876.6	-0.3	876.3	876.6	-0.3	876.3	876.6	-0.3
U24875	875.7	876.6	-0.9	875.7	876.6	-0.9	875.7	876.6	-0.9
U24876	876.3	877.0	-0.7	876.3	877.0	-0.7	876.3	877.0	-0.7
U24878	876.3	877.0	-0.7	876.3	877.0	-0.7	876.3	877.0	-0.7
U24884	874.3	875.2	-0.9	874.3	875.2	-0.9	874.3	875.2	-0.9
U24885	878.1	877.8	0.3	878.1	877.8	0.3	878.1	877.8	0.3
U24889	878.3	878.7	-0.4	878.3	878.7	-0.4	878.3	878.7	-0.4
U24890	883.6	877.9	5.6	883.6	877.9	5.6	883.6	877.9	5.6
U24891	878.3	878.8	-0.5	878.3	878.8	-0.5	878.3	878.8	-0.5
U24897	879.3	879.5	-0.2	879.3	879.5	-0.2	879.3	879.5	-0.2
U24901	880.3	880.5	-0.2	880.3	880.5	-0.2	880.3	880.5	-0.2
U24908	875.7	876.6	-0.9	875.7	876.6	-0.9	875.7	876.6	-0.9
U24917	876.0	875.7	0.3	876.0	875.7	0.3	876.0	875.7	0.3
U24935	874.3	875.2	-0.9	874.3	875.2	-0.9	874.3	875.2	-0.9
U24966	876.0	874.0	2.0	876.0	874.0	2.0	876.0	874.0	2.0
U24971	876.6	876.4	0.2	876.6	876.3	0.2	876.6	876.3	0.2

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
U24978	875.8	876.1	-0.3	875.8	876.1	-0.3	875.8	876.0	-0.2
U24985	873.8	874.7	-0.9	873.8	874.7	-0.9	873.8	874.7	-0.9
U24987	873.3	875.4	-2.1	873.3	875.4	-2.1	873.3	875.4	-2.1
U24988	868.2	868.4	-0.2	868.2	868.4	-0.2	868.2	868.4	-0.2
U25000	875.2	875.3	-0.1	875.2	875.3	-0.1	875.2	875.3	-0.1
U25002	874.3	874.5	-0.2	874.3	874.5	-0.2	874.3	874.5	-0.2
U25237	874.4	875.0	-0.6	874.4	875.0	-0.6	874.4	875.0	-0.6
U25262	859.3	836.2	23.1	859.3	836.7	22.6	859.3	836.1	23.2
U25273	860.8	858.2	2.6	860.8	858.2	2.6	860.8	858.2	2.6
U25286	862.3	861.3	1.0	862.3	861.3	1.0	862.3	861.3	1.0
U25290	862.3	862.5	-0.2	862.3	862.5	-0.2	862.3	862.5	-0.2
U25296	864.8	864.9	-0.1	864.8	864.9	-0.1	864.8	864.9	-0.1
U25301	867.7	867.7	0.0	867.7	867.7	0.0	867.7	867.7	0.0
U25303	867.8	868.0	-0.2	867.8	868.0	-0.2	867.8	868.0	-0.2
U25304	868.3	868.4	-0.1	868.3	868.4	-0.1	868.3	868.4	-0.1
U25310	869.3	869.5	-0.2	869.3	869.5	-0.2	869.3	869.5	-0.2
U25313	871.3	870.8	0.5	871.3	870.7	0.6	871.3	870.7	0.6
U25314	871.8	871.9	-0.1	871.8	871.9	-0.1	871.8	871.9	-0.1
U25315	873.8	874.3	-0.5	873.8	874.3	-0.5	873.8	874.3	-0.5
U25316	872.8	872.9	-0.1	872.8	872.9	-0.1	872.8	872.9	-0.1
U25327	874.3	874.8	-0.5	874.3	874.8	-0.5	874.3	874.8	-0.5
U25330	873.3	873.7	-0.4	873.3	873.7	-0.4	873.3	873.7	-0.4
U25333	872.8	873.2	-0.4	872.8	873.2	-0.4	872.8	873.2	-0.4
U25347	873.1	873.4	-0.4	873.1	873.4	-0.4	873.1	873.4	-0.4
U25374	878.3	878.7	-0.4	878.3	878.7	-0.4	878.3	878.7	-0.4
U25377	878.3	878.6	-0.3	878.3	878.6	-0.3	878.3	878.6	-0.3
U25379	877.8	878.1	-0.3	877.8	878.1	-0.3	877.8	878.1	-0.3
U25385	876.3	876.6	-0.3	876.3	876.6	-0.3	876.3	876.6	-0.3
U25390	874.3	874.7	-0.4	874.3	874.7	-0.4	874.3	874.7	-0.4
U25395	873.8	874.4	-0.6	873.8	874.4	-0.6	873.8	874.4	-0.6
U25401	873.3	874.4	-1.1	873.3	874.4	-1.1	873.3	874.4	-1.1
U25403	873.3	874.4	-1.1	873.3	874.4	-1.1	873.3	874.4	-1.1
U25405	874.3	874.5	-0.3	874.3	874.5	-0.3	874.3	874.5	-0.3
U25410	874.3	875.0	-0.7	874.3	875.0	-0.7	874.3	875.0	-0.7
U25437	873.3	874.4	-1.1	873.3	874.4	-1.1	873.3	874.4	-1.1
U25490	867.1	868.6	-1.5	867.1	868.6	-1.5	867.1	868.6	-1.5
U25515	873.1	874.1	-1.0	873.1	874.1	-1.0	873.1	874.1	-1.0
U25527	867.5	868.6	-1.1	867.5	868.6	-1.1	867.5	868.6	-1.1
U25555	870.0	868.0	2.0	870.0	868.0	2.0	870.0	868.0	2.0
U25559	870.0	872.0	-2.1	870.0	872.0	-2.1	870.0	872.0	-2.1

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
U25560	872.7	873.8	-1.1	872.7	873.8	-1.1	872.7	873.8	-1.1
U25857	859.2	859.7	-0.5	859.2	859.7	-0.5	859.2	859.7	-0.5
U25863	859.3	860.7	-1.4	859.3	860.7	-1.4	859.3	860.7	-1.4
U25880	861.8	862.9	-1.1	861.8	862.9	-1.1	861.8	862.9	-1.1
U25888	865.3	866.8	-1.5	865.3	866.8	-1.5	865.3	866.8	-1.5
U25890	864.3	865.5	-1.2	864.3	865.5	-1.2	864.3	865.5	-1.2
U25893	864.8	866.3	-1.5	864.8	866.3	-1.5	864.8	866.3	-1.5
U25895	866.1	867.1	-1.0	866.1	867.1	-1.0	866.1	867.1	-1.0
U25921	866.5	867.5	-1.0	866.0	867.5	-1.5	866.0	867.5	-1.5
U25934	866.4	868.1	-1.7	866.4	868.1	-1.7	866.4	868.1	-1.7
U25936	866.8	868.0	-1.2	866.8	868.0	-1.2	866.8	868.0	-1.2
U25948	867.1	868.5	-1.5	867.1	868.5	-1.5	867.1	868.5	-1.5
U25955	867.3	869.1	-1.8	867.3	869.1	-1.8	867.3	869.1	-1.8
U25957	868.0	869.4	-1.5	868.0	869.4	-1.5	868.0	869.4	-1.5
U25965	868.3	869.9	-1.6	868.3	869.9	-1.6	868.3	869.9	-1.6
U25967	868.4	870.0	-1.6	868.4	870.0	-1.6	868.4	870.0	-1.6
U25972	868.8	870.3	-1.5	868.8	870.3	-1.5	868.8	870.3	-1.5
U25973	869.3	870.8	-1.5	869.3	870.8	-1.5	869.3	870.8	-1.5
U25976	869.9	870.9	-1.0	869.9	870.9	-1.0	869.9	870.9	-1.0
U25980	869.8	871.2	-1.4	869.8	871.2	-1.4	869.8	871.2	-1.4
U25981	870.3	871.6	-1.3	870.3	871.6	-1.3	870.3	871.6	-1.3
U25983	870.5	871.7	-1.2	870.5	871.7	-1.2	870.5	871.7	-1.2
U25984	870.8	872.0	-1.2	870.8	872.0	-1.2	870.8	872.0	-1.2
U25990	871.4	872.6	-1.2	871.4	872.6	-1.2	871.4	872.6	-1.2
U25991	871.3	872.5	-1.2	871.3	872.5	-1.2	871.3	872.5	-1.2
U25994	871.8	872.9	-1.1	871.8	872.9	-1.1	871.8	872.9	-1.1
U25998	872.3	873.4	-1.1	872.3	873.4	-1.1	872.3	873.4	-1.1
U25999	872.4	873.4	-1.0	872.4	873.4	-1.0	872.4	873.4	-1.0
U26011	879.3	879.5	-0.2	879.3	879.5	-0.2	879.3	879.5	-0.2
U26013	883.8	884.0	-0.2	883.8	884.0	-0.2	883.8	884.0	-0.2
U26017	886.3	886.6	-0.3	886.3	886.6	-0.3	886.3	886.6	-0.3
U26018	885.8	886.0	-0.2	885.8	886.0	-0.2	885.8	886.0	-0.2
U26020	886.3	886.8	-0.5	886.3	886.8	-0.5	886.3	886.8	-0.5
U26022	887.3	887.6	-0.3	887.3	887.6	-0.3	887.3	887.6	-0.3
U26024	892.3	892.6	-0.3	892.3	892.6	-0.3	892.3	892.6	-0.3
U26029	894.3	894.7	-0.4	894.3	894.7	-0.4	894.3	894.7	-0.4
U26067	870.3	871.6	-1.3	870.3	871.6	-1.3	870.3	871.6	-1.3
U26106	867.0	869.4	-2.5	867.0	869.4	-2.5	867.0	869.4	-2.5
U26125	871.0	871.7	-0.8	871.0	871.7	-0.8	871.0	871.7	-0.8
U26127	865.3	868.5	-3.2	865.3	868.5	-3.2	865.3	868.5	-3.2

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
U26132	871.1	871.9	-0.8	871.1	871.9	-0.8	871.1	871.9	-0.8
U26165	871.6	872.4	-0.8	871.6	872.4	-0.8	871.6	872.4	-0.8
U26167	871.6	872.4	-0.9	871.6	872.4	-0.9	871.6	872.4	-0.9
U26487	872.3	873.1	-0.8	872.3	873.1	-0.8	872.3	873.1	-0.8
U26513	885.3	885.5	-0.2	885.3	885.5	-0.2	885.3	885.5	-0.2
U26516	878.8	879.0	-0.2	878.8	879.0	-0.2	878.8	879.0	-0.2
U26521	873.3	873.7	-0.4	873.3	873.7	-0.4	873.3	873.7	-0.4
U26552	878.8	879.1	-0.3	878.8	879.1	-0.3	878.8	879.1	-0.3
U26555	882.3	882.6	-0.3	882.3	882.6	-0.3	882.3	882.6	-0.3
U26556	885.3	885.6	-0.3	885.3	885.6	-0.3	885.3	885.6	-0.3
U26558	889.3	889.6	-0.3	889.3	889.6	-0.3	889.3	889.6	-0.3
U26560	885.8	885.8	0.0	885.8	885.8	0.0	885.8	885.8	0.0
U26563	893.3	893.6	-0.3	893.3	893.6	-0.3	893.3	893.6	-0.3
U26565	899.8	900.0	-0.2	899.8	900.0	-0.2	899.8	900.0	-0.2
U26570	906.3	906.5	-0.2	906.3	906.5	-0.2	906.3	906.5	-0.2
U26576	906.3	906.8	-0.5	906.3	906.8	-0.5	906.3	906.8	-0.5
U26582	908.3	908.5	-0.2	908.3	908.5	-0.2	908.3	908.5	-0.2
U26585	910.3	910.6	-0.3	910.3	910.6	-0.3	910.3	910.6	-0.3
U26629	879.7	879.8	-0.1	879.7	879.8	-0.1	879.7	879.8	-0.1
U26652	889.3	889.8	-0.5	889.3	889.8	-0.5	889.3	889.8	-0.5
U26697	893.3	893.8	-0.5	893.3	893.8	-0.5	893.3	893.8	-0.5
U26704	883.7	884.0	-0.3	883.7	884.0	-0.3	883.7	884.0	-0.3
U26705	881.7	882.0	-0.3	881.7	882.0	-0.3	881.7	882.0	-0.3
U26724	894.3	894.9	-0.6	894.3	894.9	-0.6	894.3	894.9	-0.6
U26732	895.8	895.4	0.4	895.8	895.4	0.4	895.8	895.4	0.4
U26739	895.3	895.8	-0.5	895.3	895.8	-0.5	895.3	895.8	-0.5
U26773	896.3	896.8	-0.5	896.3	896.8	-0.5	896.3	896.8	-0.5
U27025	898.8	898.8	0.0	898.8	898.8	0.0	898.8	898.8	0.0
U27166	901.3	901.7	-0.4	901.3	901.7	-0.4	901.3	901.7	-0.4
U27229	905.3	905.7	-0.4	905.3	905.7	-0.4	905.3	905.7	-0.4
U27349	907.8	908.2	-0.4	907.8	908.2	-0.4	907.8	908.2	-0.4
U27399	910.1	910.5	-0.4	910.1	910.5	-0.4	910.1	910.5	-0.4
U27437	912.0	912.3	-0.3	912.0	912.3	-0.3	912.0	912.3	-0.3
U27577	910.9	913.1	-2.2	911.4	913.1	-1.7	911.4	913.1	-1.7
U27583	914.6	912.5	2.0	914.6	912.5	2.0	914.6	912.5	2.0
U27793	919.3	919.6	-0.3	919.3	919.6	-0.3	919.3	919.6	-0.3
U99997	864.6	864.8	-0.2	864.6	864.8	-0.2	864.6	864.8	-0.2
U99998	864.3	865.3	-1.0	864.3	865.3	-1.0	864.3	865.3	-1.0
V13912	873.6	873.9	-0.3	873.6	873.9	-0.3	873.6	873.9	-0.4
V13967	872.7	873.9	-1.2	872.7	873.9	-1.2	872.7	873.9	-1.2

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
V13972	873.4	873.9	-0.5	873.4	873.9	-0.5	873.4	873.9	-0.5
V13973	873.4	873.9	-0.5	873.4	873.9	-0.5	873.4	873.9	-0.5
V14356	874.0	874.6	-0.6	874.0	874.6	-0.6	874.0	874.6	-0.6
V14356-1	874.2	874.7	-0.4	874.2	874.7	-0.4	874.2	874.7	-0.4
V14356-2	874.2	874.7	-0.4	874.2	874.7	-0.4	874.2	874.7	-0.4
V14497	873.2	873.9	-0.7	873.2	873.9	-0.7	873.2	873.9	-0.7
V14500.1	875.3	875.1	0.2	875.3	875.1	0.2	875.3	875.1	0.2
V14500-1	874.9	875.3	-0.4	874.9	875.3	-0.4	874.9	875.3	-0.4
V14500-2	874.6	875.3	-0.7	874.6	875.3	-0.7	874.6	875.3	-0.7
V14521-1	875.6	876.0	-0.3	875.6	876.0	-0.3	875.6	876.0	-0.3
V14521-2	876.1	876.2	-0.2	876.1	876.2	-0.2	876.1	876.2	-0.2
V14593	875.0	875.4	-0.4	875.0	875.4	-0.4	875.0	875.4	-0.4
V14594	873.3	873.9	-0.6	873.3	873.9	-0.6	873.3	873.9	-0.6
V14625	877.6	877.9	-0.4	877.6	877.9	-0.4	877.6	877.9	-0.4
V14709	874.6	875.1	-0.5	874.6	875.1	-0.5	874.6	875.1	-0.5
V14718	872.3	873.9	-1.6	872.3	873.9	-1.6	872.3	873.9	-1.6
V14721	877.2	877.4	-0.2	877.2	877.4	-0.2	877.2	877.4	-0.2
V14722	875.0	875.3	-0.3	875.0	875.3	-0.3	875.0	875.3	-0.3
V14958	875.3	875.1	0.2	875.3	875.1	0.2	875.3	875.1	0.2
V14976	874.3	875.0	-0.7	874.3	874.9	-0.6	874.3	875.0	-0.7
V15129	875.3	875.0	0.3	875.3	875.0	0.3	875.3	875.0	0.3
V15133	874.3	875.0	-0.7	874.3	875.0	-0.7	874.3	875.0	-0.7
V15134	875.3	875.8	-0.5	875.3	875.8	-0.5	875.3	875.8	-0.5
V15135	875.1	875.0	0.0	875.1	875.0	0.0	875.1	875.0	0.0
V15137	874.8	874.9	-0.1	874.8	874.9	-0.1	874.8	874.9	-0.1
V15138	874.8	875.3	-0.5	874.8	875.3	-0.5	874.8	875.3	-0.5
V15144	874.8	875.0	-0.2	874.8	875.0	-0.2	874.8	875.0	-0.2
V15177	874.3	874.4	-0.1	874.3	874.4	-0.1	874.3	874.4	-0.1
V15211	874.3	874.9	-0.6	874.3	874.9	-0.6	874.3	874.9	-0.6
V15325	873.3	874.0	-0.7	873.3	874.0	-0.7	873.3	874.0	-0.7
V15330	873.3	873.5	-0.2	873.3	873.5	-0.2	873.3	873.5	-0.2
V15388	873.0	873.6	-0.6	873.0	873.6	-0.6	873.0	873.6	-0.6
V15403	872.6	873.0	-0.4	872.6	873.0	-0.4	872.6	873.0	-0.4
V15405	872.3	872.9	-0.6	872.3	872.9	-0.6	872.3	872.9	-0.6
V15479	873.3	873.6	-0.3	873.3	873.6	-0.3	873.3	873.6	-0.3
V15737	871.3	872.1	-0.8	871.3	872.1	-0.8	871.3	872.1	-0.8
V15855	871.3	872.1	-0.8	871.3	872.1	-0.8	871.3	872.1	-0.8
V15871	872.3	873.0	-0.7	872.3	873.0	-0.7	872.3	873.0	-0.7
V15873	866.0	0.0	866.0	866.0	0.0	866.0	866.0	0.0	866.0
V15874	863.2	0.0	863.2	863.2	0.0	863.2	863.2	0.0	863.2

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
V15876	867.1	0.0	867.1	867.1	0.0	867.1	867.1	0.0	867.1
V15877	867.1	0.0	867.1	867.1	0.0	867.1	867.1	0.0	867.1
V15881	865.8	0.0	865.8	865.8	0.0	865.8	865.8	0.0	865.8
V15882	873.3	873.4	-0.1	873.3	873.4	-0.1	873.3	873.4	-0.1
V15884	872.8	873.1	-0.3	872.8	873.0	-0.2	872.8	873.1	-0.3
V15885	873.3	873.4	-0.1	873.3	873.4	-0.1	873.3	873.4	-0.1
V15887	872.8	873.1	-0.3	872.8	873.1	-0.3	872.8	873.1	-0.3
V15888	872.3	872.8	-0.5	872.3	872.8	-0.5	872.3	872.8	-0.5
V15889	872.3	872.7	-0.4	872.3	872.7	-0.4	872.3	872.7	-0.4
V15890	871.8	872.3	-0.5	871.8	872.3	-0.5	871.8	872.3	-0.5
V15892	871.3	871.8	-0.5	871.3	871.8	-0.5	871.3	871.8	-0.5
V15893	868.7	870.9	-2.2	868.7	870.9	-2.3	868.7	870.9	-2.3
V15894	869.8	871.0	-1.2	869.8	871.0	-1.2	869.8	871.1	-1.3
V15897	866.0	871.0	-5.0	866.0	871.0	-5.0	866.0	870.9	-4.9
V15898	868.8	870.8	-2.1	868.8	870.9	-2.1	868.8	870.9	-2.1
V15900	868.0	871.3	-3.3	868.0	871.3	-3.3	868.0	871.3	-3.3
V15943	871.3	872.0	-0.7	871.3	872.0	-0.7	871.3	872.0	-0.7
V16006	872.3	873.0	-0.7	872.3	873.0	-0.7	872.3	873.0	-0.7
V16025	867.8	871.3	-3.5	867.8	871.3	-3.5	867.8	871.3	-3.5
V16087	872.3	873.0	-0.7	872.3	873.0	-0.7	872.3	873.0	-0.7
V16089	871.0	871.7	-0.8	871.0	871.7	-0.8	871.0	871.7	-0.8
V16106	870.7	871.3	-0.6	870.7	871.3	-0.6	870.7	871.3	-0.6
V16136	870.6	871.6	-0.9	870.6	871.6	-0.9	870.6	871.6	-0.9
V16160	867.4	871.2	-3.8	867.4	871.2	-3.8	867.4	871.2	-3.8
V16461	873.4	869.8	3.6	873.4	870.0	3.4	873.4	869.7	3.7
V16485	870.5	871.5	-1.1	870.5	871.5	-1.1	870.5	871.5	-1.1
V16562	873.3	873.5	-0.2	873.3	873.5	-0.2	873.3	873.5	-0.2
V16563	873.3	873.7	-0.4	873.3	873.7	-0.4	873.3	873.7	-0.4
V16564	872.8	873.1	-0.3	872.8	873.1	-0.3	872.8	873.1	-0.3
V16565	872.3	873.0	-0.7	872.3	873.0	-0.7	872.3	873.0	-0.7
V16566	872.3	872.8	-0.5	872.3	872.8	-0.5	872.3	872.8	-0.5
V16567	871.8	872.4	-0.6	871.8	872.4	-0.6	871.8	872.4	-0.6
V16568	871.3	872.0	-0.7	871.3	872.0	-0.7	871.3	872.0	-0.7
V16569	871.3	871.9	-0.6	871.3	871.9	-0.6	871.3	871.9	-0.6
V16571	870.6	871.2	-0.6	870.6	871.2	-0.6	870.6	871.2	-0.6
V16572	871.3	866.5	4.8	871.3	866.5	4.8	871.3	866.6	4.7
V16573	870.3	871.5	-1.2	870.3	871.5	-1.2	870.3	871.5	-1.2
V16574	870.3	871.5	-1.2	870.3	871.5	-1.2	870.3	871.5	-1.2
V16575	871.3	867.4	3.9	871.3	867.6	3.7	871.3	867.4	3.9
V16577	870.3	864.8	5.5	870.3	864.8	5.5	870.3	864.8	5.5

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
V16578	870.3	871.5	-1.2	870.3	871.5	-1.2	870.3	871.5	-1.2
V16582	873.4	869.1	4.3	873.4	869.2	4.2	873.4	869.1	4.3
V16583	870.3	870.8	-0.5	870.3	870.8	-0.5	870.3	870.8	-0.5
V16584	873.4	869.6	3.8	873.4	869.7	3.7	873.4	869.6	3.8
V16587	869.3	870.8	-1.5	869.3	870.8	-1.5	869.3	870.8	-1.5
V16588	870.3	870.6	-0.3	870.3	870.6	-0.3	870.3	870.6	-0.3
V16589	869.3	870.8	-1.5	869.3	870.8	-1.5	869.3	870.8	-1.5
V16590	869.3	870.8	-1.5	869.3	870.8	-1.5	869.3	870.8	-1.5
V16591	869.3	870.8	-1.5	869.3	870.8	-1.5	869.3	870.8	-1.5
V16687	871.3	871.8	-0.5	871.3	871.8	-0.5	871.3	871.8	-0.5
V16693	873.0	873.2	-0.2	873.0	873.2	-0.2	873.0	873.2	-0.2
V16701	869.6	866.6	2.9	869.6	866.6	2.9	869.6	866.6	2.9
V16722	872.8	873.0	-0.2	872.8	873.0	-0.2	872.8	873.0	-0.2
V16730	872.3	872.8	-0.5	872.3	872.8	-0.5	872.3	872.8	-0.5
V16731	872.6	872.9	-0.2	872.6	872.9	-0.2	872.6	872.9	-0.2
V16738	867.8	867.0	0.8	867.8	866.7	1.1	867.8	866.8	1.0
V16934	862.6	863.1	-0.5	862.6	863.1	-0.5	862.6	863.1	-0.5
V16975	872.3	872.6	-0.3	872.3	872.6	-0.3	872.3	872.6	-0.3
V17039	866.3	866.8	-0.5	866.3	866.8	-0.5	866.3	866.8	-0.5
V17049	873.3	873.8	-0.5	873.3	873.8	-0.5	873.3	873.8	-0.5
V17147	866.3	866.8	-0.5	866.3	866.8	-0.5	866.3	866.8	-0.5
V17149	863.4	863.6	-0.2	863.4	863.6	-0.2	863.4	863.6	-0.2
V17150	863.5	863.7	-0.3	863.5	863.7	-0.3	863.5	863.7	-0.3
V17151	862.1	862.9	-0.8	862.1	862.9	-0.8	862.1	862.9	-0.8
V17153	875.3	875.5	-0.2	875.3	875.5	-0.2	875.3	875.5	-0.2
V17154	866.6	866.9	-0.3	866.6	866.9	-0.3	866.6	866.9	-0.3
V17170	874.3	874.5	-0.2	874.3	874.5	-0.2	874.3	874.5	-0.2
V17173	873.8	874.0	-0.2	873.8	874.0	-0.2	873.8	874.0	-0.2
V17178	873.8	874.1	-0.3	873.8	874.1	-0.3	873.8	874.1	-0.3
V17180	874.1	874.4	-0.3	874.1	874.4	-0.3	874.1	874.4	-0.3
V17182	874.3	874.6	-0.3	874.3	874.6	-0.3	874.3	874.6	-0.3
V17210	873.3	873.8	-0.5	873.3	873.8	-0.5	873.3	873.8	-0.5
V17218	863.1	862.9	0.1	863.1	862.9	0.1	863.1	862.9	0.1
V17219	866.3	866.8	-0.5	866.3	866.8	-0.5	866.3	866.8	-0.5
V17275	874.3	874.3	0.0	874.3	874.3	0.0	874.3	874.3	0.0
V17285	866.8	867.0	-0.2	866.8	867.0	-0.2	866.8	867.0	-0.2
V17295	871.3	872.6	-1.3	871.3	872.6	-1.3	871.3	872.6	-1.3
V17334	875.3	874.8	0.5	875.3	874.8	0.5	875.3	874.8	0.5
V17346	860.2	862.9	-2.7	860.2	862.9	-2.7	860.2	862.9	-2.7
V17353	867.1	867.3	-0.2	867.1	867.3	-0.2	867.1	867.3	-0.2

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
V17354	860.3	862.9	-2.6	860.3	862.9	-2.6	860.3	862.9	-2.6
V17538	867.3	867.5	-0.2	867.3	867.5	-0.2	867.3	867.5	-0.2
V17647	861.2	862.9	-1.7	861.2	862.9	-1.7	861.2	862.9	-1.7
V17785	867.3	867.6	-0.3	867.3	867.6	-0.3	867.3	867.6	-0.3
V17803	876.3	875.5	0.8	876.3	875.5	0.8	876.3	875.5	0.8
V17827	901.7	901.8	-0.1	901.7	901.8	-0.1	901.7	901.8	-0.1
V17828	891.0	886.4	4.6	891.0	886.3	4.7	891.0	886.4	4.6
V17830	901.1	899.0	2.1	901.1	899.0	2.1	901.1	899.0	2.1
V17831	862.5	864.2	-1.7	862.5	864.2	-1.7	862.5	864.2	-1.7
V17832	863.4	864.2	-0.8	863.4	864.2	-0.8	863.4	864.2	-0.8
V17833	891.1	887.1	4.1	891.1	887.0	4.1	891.1	887.1	4.1
V17835	863.5	863.9	-0.4	863.5	863.9	-0.4	863.5	863.9	-0.4
V17839	863.0	863.4	-0.5	863.0	863.4	-0.5	863.0	863.4	-0.5
V17840	862.9	863.3	-0.4	862.9	863.3	-0.4	862.9	863.3	-0.4
V17841	860.9	862.9	-2.0	860.9	862.9	-2.0	860.9	862.9	-2.0
V17842	861.7	862.9	-1.2	861.7	862.9	-1.2	861.7	862.9	-1.2
V17843	861.5	862.9	-1.4	861.5	862.9	-1.4	861.5	862.9	-1.4
V17846	860.2	862.9	-2.7	860.2	862.9	-2.7	860.2	862.9	-2.7
V17863	875.3	875.5	-0.2	875.3	875.5	-0.2	875.3	875.5	-0.2
V17866	875.8	875.5	0.3	875.8	875.5	0.3	875.8	875.5	0.3
V17868	876.3	876.2	0.1	876.3	876.2	0.1	876.3	876.2	0.1
V17869	876.6	876.7	-0.2	876.6	876.7	-0.2	876.6	876.7	-0.2
V17870	876.3	876.8	-0.5	876.3	876.8	-0.5	876.3	876.8	-0.5
V17872	875.1	875.3	-0.2	875.1	875.3	-0.2	875.1	875.3	-0.2
V17874	874.3	874.7	-0.4	874.3	874.7	-0.4	874.3	874.7	-0.4
V17875	874.3	874.6	-0.3	874.3	874.6	-0.3	874.3	874.6	-0.3
V17876	874.3	874.1	0.2	874.3	874.1	0.2	874.3	874.1	0.2
V17878	870.8	870.8	0.0	870.8	870.8	0.0	870.8	870.8	0.0
V17880	874.3	874.5	-0.2	874.3	874.5	-0.2	874.3	874.5	-0.2
V17883	875.3	875.6	-0.3	875.3	875.6	-0.3	875.3	875.6	-0.3
V17884	875.3	875.7	-0.4	875.3	875.7	-0.4	875.3	875.7	-0.4
V17885	875.3	875.7	-0.4	875.3	875.7	-0.4	875.3	875.7	-0.4
V17922	863.1	863.9	-0.8	863.1	863.9	-0.8	863.1	863.9	-0.8
V17947	862.1	862.9	-0.8	862.1	862.9	-0.8	862.1	862.9	-0.8
V17958	860.3	863.9	-3.6	860.3	863.9	-3.6	860.3	863.9	-3.6
V17977	885.6	885.9	-0.4	885.6	885.9	-0.4	885.6	885.9	-0.4
V17982	885.3	885.6	-0.3	885.3	885.6	-0.3	885.3	885.6	-0.3
V17983	884.2	884.5	-0.3	884.2	884.5	-0.3	884.2	884.5	-0.3
V17984	867.1	862.3	4.8	867.1	862.3	4.8	867.1	862.3	4.8
V18228	869.5	861.9	7.6	869.5	861.9	7.6	869.5	861.9	7.6

*Negative freeboad (FB) depicts flooding

Table B6 -XPSWMM Node Results
I-35W Corridor Drainage Study

100 year Storm									
Node Name	Existing Conditions[1]			Proposed Conditions [2]			Proposed Conditions with Rate Control Structures[3]		
	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)	TOC (ft)	Max Water El (ft)	FB (ft)
V18248	872.5	872.9	-0.4	872.5	872.9	-0.4	872.5	872.9	-0.4
V18261	880.5	881.0	-0.5	880.5	881.0	-0.5	880.5	881.0	-0.5
V18538	886.3	886.5	-0.2	886.3	886.5	-0.2	886.3	886.5	-0.2
V18539	882.0	882.4	-0.4	882.0	882.4	-0.4	882.0	882.4	-0.4
V18545	867.5	867.8	-0.2	867.5	867.8	-0.2	867.5	867.8	-0.2
V18546	869.0	862.5	6.5	869.0	862.4	6.6	869.0	862.4	6.6
V18547	869.4	869.8	-0.4	869.4	869.8	-0.4	869.4	869.8	-0.4
V18548	866.6	865.7	0.9	866.6	865.7	0.9	866.6	865.7	0.9
V18549	879.8	880.3	-0.5	879.8	880.3	-0.5	879.8	880.3	-0.5
V18550	876.0	876.4	-0.4	876.0	876.4	-0.4	876.0	876.4	-0.4
V18551	880.4	880.9	-0.5	880.4	880.9	-0.5	880.4	880.9	-0.5
V18570	870.3	861.7	8.6	870.3	861.7	8.6	870.3	861.7	8.6
V18612	872.0	872.9	-0.9	872.0	872.9	-0.9	872.0	872.9	-0.9
V18645	871.5	871.9	-0.4	871.5	871.9	-0.4	871.5	871.9	-0.4
V19138	871.1	861.5	9.6	871.1	861.5	9.6	871.1	861.4	9.7
V19728	865.5	861.4	4.1	865.5	861.4	4.1	865.5	861.3	4.2
V19898	854.2	861.3	-7.1	854.2	861.3	-7.1	854.2	861.3	-7.1
V19981	845.0	861.3	-16.3	845.0	861.3	-16.3	845.0	861.3	-16.3
V20617	844.0	861.3	-17.3	844.0	861.3	-17.3	844.0	861.3	-17.3
V20772	846.5	861.3	-14.8	846.5	861.3	-14.8	846.5	861.3	-14.8
V21246	865.9	866.3	-0.4	865.9	866.3	-0.4	865.9	866.3	-0.4
V21321	878.3	878.5	-0.2	878.3	878.5	-0.2	878.3	878.5	-0.2
V21430	871.4	871.8	-0.4	871.4	871.8	-0.4	871.4	871.8	-0.4
V21913	873.4	873.9	-0.5	873.4	873.9	-0.5	873.4	873.9	-0.5
V22048	874.1	874.4	-0.3	874.1	874.4	-0.3	874.1	874.4	-0.3
V22050	880.3	880.6	-0.3	880.3	880.6	-0.3	880.3	880.6	-0.3
V22055	879.3	879.6	-0.3	879.3	879.6	-0.3	879.3	879.6	-0.3
VOUT	869.8	859.4	10.4	869.8	859.4	10.4	869.8	859.4	10.4
VWEIR	871.1	860.6	10.6	871.1	860.6	10.6	871.1	860.6	10.6
WE_RU	896.4	891.0	5.4	896.4	891.0	5.4	896.4	891.0	5.4

*Negative freeboad (FB) depicts flooding

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study
HENNC 113114
[1]2014 Existing Conditions (Atlas 14)
[2]Proposed Conditions Model
[3]Proposed Conditions with Rate Control Structures
Date: 7.3.14
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Tables

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
755.1	Circular	1034	1056	1115	1023	1067	1104	1034	1064	1135
854.1	Circular	44	72	83	45	73	83	36	86	94
5745.1	Circular	6	9	9	6	9	9	6	9	9
5745.2	Natural	0	0	4	0	0	4	0	0	4
5747.1	Circular	20	23	23	23	23	23	21	23	23
5747.2	Natural	0	17	43	1	29	61	0	19	44
5751.1	Circular	20	30	31	24	32	31	21	30	31
5751.2	Natural	0	0	25	0	9	43	0	1	26
5756.1	Circular	18	47	58	24	49	60	22	47	57
5756.2	Natural	0	0	41	0	0	32	0	0	16
5759.1	Circular	17	29	51	17	30	49	13	22	38
5759.2	Natural	0	0	0	0	0	4	0	0	0
5762.1	Circular	16	28	42	17	29	49	13	22	38
5762.2	Natural	0	0	18	0	0	0	0	0	0
5764.1	Circular	16	29	46	17	29	49	13	22	38
5764.2	Natural	0	0	0	0	0	0	0	0	0
5765.1	Circular	25	44	67	17	29	49	23	39	69
5765.2	Natural	0	0	0	0	0	0	0	0	0
5768.1	Circular	48	85	97	47	83	97	47	83	102
5768.2	Natural	0	0	99	0	0	95	0	0	94
5770.1	Circular	48	85	118	47	83	118	47	83	126
5770.2	Natural	0	0	50	0	0	46	0	0	28
5773.1	Circular	56	93	106	55	92	106	55	88	108
5773.2	Natural	0	0	0	0	0	0	0	0	0
5778.1	Circular	8	13	13	9	14	14	9	16	17
5778.2	Natural	0	1	14	0	2	15	0	0	15
5780.1	Circular	8	14	28	9	15	28	9	14	62
5780.2	Natural	0	0	32	0	0	26	0	0	-42
5781.1	Circular	8	14	38	9	15	38	9	14	76
5781.2	Natural	0	0	14	0	0	9	0	0	0
5784.1	Circular	8	13	17	9	13	17	9	15	30
5784.2	Natural	0	7	15	0	7	16	0	0	24
5787.1	Circular	8	13	13	8	13	13	8	13	13
5787.2	Natural	0	0	-20	0	0	-20	0	0	-20

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
5789.1	Circular	8	13	13	8	13	13	8	13	13
5789.2	Natural	0	0	16	0	0	16	0	0	16
5793.1	Circular	8	13	31	8	13	31	8	13	31
5793.2	Natural	0	0	0	0	0	0	0	0	#N/A
5795.1	Circular	25	42	50	25	42	50	25	42	#N/A
5795.2	Natural	0	0	0	0	0	0	0	0	#N/A
5797.1	Circular	25	42	49	25	42	50	25	42	#N/A
5797.2	Natural	0	0	0	0	0	0	0	0	#N/A
5799.1	Circular	25	41	50	25	42	50	25	42	#N/A
5799.2	Natural	0	0	0	0	0	0	0	0	#N/A
5800.1	Circular	25	41	50	25	41	50	25	41	#N/A
5800.2	Natural	0	0	0	0	0	0	0	0	#N/A
5802.1	Circular	8	13	23	8	13	23	8	13	23
5802.2	Natural	0	0	-13	0	0	-13	0	0	-13
5803.1	Circular	8	12	26	8	12	27	8	12	#N/A
5803.2	Natural	0	0	15	0	0	15	0	0	#N/A
5806.1	Circular	25	40	49	25	41	49	25	41	#N/A
5806.2	Natural	0	0	0	0	0	0	0	0	#N/A
5807.1	Circular	88	130	152	83	130	151	78	128	#N/A
5807.2	Natural	0	0	0	0	0	0	0	0	#N/A
5815.1	Circular	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	47	-88	#N/A
5815.2	Natural	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0	0	#N/A
5816.1	Circular	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	38	55	#N/A
12 45_PL	Circular	0	0	0	0	0	0	0	0	0
12 49RUB	Circular	-2	-2	-3	-2	-2	-3	-2	-2	-3
12" 45_PO	Circular	3	3	2	3	3	2	3	3	2
12" 4_44	Circular	3	3	3	2	3	3	3	3	3
12" 47_PO	Circular	2	3	3	2	3	3	2	3	3
12" 48_3	Circular	2	3	3	2	3	3	2	3	3
12" 48_4	Circular	9	8	8	9	8	8	9	8	8
12" 48_CL	Circular	5	6	6	5	6	6	5	6	6
12" 48_POA	Circular	3	3	3	3	3	4	3	3	5
12" 49_PLM	Circular	-2	-1	-1	-2	-1	-1	-2	-1	-1
12" 49_WE.	Circular	5	5	5	5	5	5	5	5	5
12" 49_WEM	Circular	6	6	6	6	6	6	6	6	6
12" 50_1	Circular	2	3	5	2	3	5	2	3	5
12" 50_BE	Circular	8	8	8	8	8	8	8	8	8
12" 50_NI	Circular	9	9	9	9	9	9	9	9	9
12" 50_ST	Circular	2	3	6	2	3	7	2	3	6
12" 51_ST	Circular	3	5	5	3	5	5	3	5	5
12" BE_50	Circular	7	7	7	7	7	7	7	7	7
12" BE_61	Circular	3	3	3	3	3	3	3	3	3
12" EAST	Circular	1	2	2	1	2	2	1	2	2
12" NI_RU	Circular	6	6	6	6	6	6	6	6	6
12" RU.1	Circular	6	6	6	6	6	6	6	6	6
12" RU_WE	Circular	6	6	6	6	6	6	6	6	6
12" WE_RU	Circular	1	2	2	1	2	2	1	2	2
12" WEST	Circular	1	2	2	1	2	2	1	2	2
15 43_PI	Circular	-7	-8	-9	-7	-8	-9	-7	-8	-9
15" 44_POA	Circular	-5	-5	-5	-5	-5	-5	-5	-5	-5
15" 48_4A	Circular	12	12	11	12	12	11	12	12	11

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
15" 48_BL	Circular	8	7	8	8	7	8	8	7	8
15" 48_BLM	Circular	10	7	9	10	7	9	10	7	9
15" 48_WE	Circular	12	14	14	12	14	14	12	14	14
15" 49_1.1	Circular	15	15	15	15	15	15	15	15	15
15" 49_NI	Circular	19	19	19	19	19	19	19	19	19
15" 49_ST.	Circular	23	23	21	23	23	21	23	23	21
15" 50_NIA	Circular	12	12	12	12	12	12	12	12	12
15" 50_STA	Circular	11	17	17	11	17	17	11	17	17
15" 50_STB	Circular	11	17	17	11	17	17	11	17	17
15" ST_49F	Circular	14	17	17	14	17	17	14	17	17
18 42_PL	Circular	4	-10	12	4	-10	12	4	-10	12
18" 46_PO	Circular	8	9	11	8	7	9	8	8	13
18" 48_1	Circular	15	15	14	15	15	14	15	15	14
18" 48_NI	Circular	14	14	13	14	14	13	14	14	13
18" 48_NIA	Circular	16	15	15	16	15	15	16	15	15
18" 49_STE	Circular	17	17	18	16	16	18	15	18	17
18" N510	Circular	8	8	-8	8	8	-8	8	8	-8
21" 43_PO	Circular	10	10	-7	12	11	8	11	10	-7
21" 44_2	Circular	11	9	8	7	15	8	5	6	8
21" 44_3	Circular	11	12	10	11	12	10	11	12	10
21" 44_3M	Circular	14	-10	10	16	15	10	12	-14	10
21" 48_5M	Circular	9	10	-9	9	10	-9	9	10	12
21" 48_PO	Circular	8	8	-8	7	8	-8	8	8	-8
21" 48_ST	Circular	20	22	22	20	22	22	20	22	22
21" 49_STB	Circular	20	20	22	20	21	22	22	21	22
21" 49_STC	Circular	20	19	19	20	19	19	20	19	19
21" ST_RU	Circular	20	20	20	20	20	20	20	20	20
24 46_LY	Circular	2	2	2	2	2	2	2	2	2
24" 44_3A	Circular	14	15	13	13	14	14	13	14	14
24" 44_BL	Circular	0	0	0	0	0	0	0	0	0
24" 44_PO	Circular	-18	-18	-18	-18	-18	-18	-18	-18	-18
27" 44_CL	Circular	19	18	18	18	18	18	19	19	18
27" 44CL_M	Circular	16	16	17	16	16	16	16	16	16
27" 45_2	Circular	7	-8	2	8	-6	3	-7	-7	2
27" 45_3	Circular	-30	-26	14	23	-30	14	12	-28	14
27" 45_3A	Circular	-34	-22	-15	-26	-20	-15	-20	-22	-15
27" 46_2A	Circular	6	9	13	8	8	13	-12	9	13
27" 46_2M	Circular	-10	11	13	-8	10	13	-9	10	13
27" 46_MA	Circular	11	12	14	12	12	14	12	12	14
30" 43_2	Circular	18	18	17	17	18	18	19	18	17
30" 43_3	Circular	-21	20	19	19	21	19	19	20	20
30" 44_4	Circular	21	22	21	22	22	21	22	22	21
30" 44_4A	Circular	22	23	23	23	23	23	23	23	23
30" 44_5 B	Circular	19	23	19	27	23	23	24	29	18
30" 45_3B	Circular	-29	-25	20	-27	-24	20	-26	-24	20
30" 45_3C	Circular	-26	23	20	-26	23	20	-26	24	20
30" 45_3M	Circular	-24	20	16	-24	21	16	-24	-24	16
30" 45_CL	Circular	-16	-17	14	17	15	14	18	15	15
30" 45_CLA	Circular	19	21	18	19	18	18	19	18	19
30" 46_3	Circular	17	21	20	17	21	20	17	21	20
30" 46_3A	Circular	23	31	31	24	31	31	27	33	31

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
30" 46_POA	Circular	16	17	19	14	17	20	14	17	18
30" 49_2	Circular	52	55	58	52	55	58	52	55	58
30" 49_2M	Circular	52	56	65	52	56	65	52	56	65
30" 49_3	Circular	57	60	74	57	60	74	57	60	74
30" 49_3A	Circular	60	66	77	60	66	77	60	66	77
33" 43_4	Circular	29	32	35	29	32	35	29	32	36
33" 43_CL	Circular	-22	21	20	20	21	20	20	21	20
33" 45_4	Circular	22	35	26	22	24	26	22	24	26
33" 46_4	Circular	35	39	40	35	39	39	35	39	40
33" 46_CL	Circular	31	34	34	30	33	36	31	33	33
33" 46_CLA	Circular	33	38	37	34	38	38	34	38	37
33" 49_4	Circular	48	48	47	48	48	47	48	48	47
33" 49_CL	Circular	58	58	57	58	58	57	58	58	57
35W100.1	Circular	34	43	40	34	43	40	34	43	40
35W100.2	Natural	0	14	53	0	13	53	0	14	53
35W101.1	Circular	37	50	49	37	50	49	37	50	49
35W101.2	Natural	0	15	65	0	14	65	0	15	65
35W102.1	Circular	36	50	48	36	51	48	36	50	48
35W102.2	Natural	0	2	72	0	1	72	0	2	72
35W103.1	Circular	36	51	48	36	51	48	36	51	48
35W103.2	Natural	0	0	65	0	0	65	0	0	65
35W104.1	Circular	42	60	62	42	60	62	42	60	62
35W104.2	Natural	0	0	79	0	0	79	0	0	79
35W105.1	Circular	41	59	65	41	59	63	41	59	65
35W105.2	Natural	0	0	78	0	0	78	0	0	78
35W106.1	Circular	41	59	65	41	59	64	41	59	65
35W106.2	Natural	0	0	68	0	0	68	0	0	68
35W107.1	Circular	40	59	68	40	59	64	40	59	68
35W107.2	Natural	0	0	69	0	0	70	0	0	69
35W108.1	Circular	40	58	69	40	58	67	40	58	69
35W108.2	Natural	0	0	54	0	0	55	0	0	55
35W109.1	Circular	40	58	70	40	58	68	40	58	71
35W109.2	Natural	0	0	54	0	0	54	0	0	54
35W110.1	Circular	39	58	75	39	58	73	39	58	75
35W110.2	Natural	0	0	41	0	0	42	0	0	41
35W111.1	Circular	39	58	81	39	58	80	39	58	81
35W111.2	Natural	0	0	-1	0	0	-1	0	0	-1
35W112.1	Circular	39	58	81	39	58	81	39	58	81
35W112.2	Natural	0	0	0	0	0	0	0	0	0
35W113.1	Circular	45	71	90	46	72	89	47	71	90
35W113.2	Natural	0	0	0	0	0	0	0	0	0
35W114.1	Circular	58	78	93	49	76	92	67	77	93
35W114.2	Natural	0	0	0	0	0	0	0	0	0
35W115.1	Circular	59	77	93	56	76	92	68	78	93
35W115.2	Natural	0	0	0	0	0	0	0	0	0
35W116.1	Circular	61	92	106	69	91	105	72	92	105
35W116.2	Natural	0	0	8	0	0	8	0	0	8
35W117.1	Circular	64	76	73	73	75	76	77	77	73
35W117.2	Natural	1	25	111	2	28	122	1	25	112
35W118.1	Circular	65	65	64	73	63	65	68	68	65
35W118.2	Natural	0	52	102	1	57	104	1	51	102

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
35W119.1	Circular	66	82	64	72	61	78	67	77	65
35W119.2	Natural	0	-42	-43	1	-43	-43	0	-43	-43
35W120.1	Circular	70	82	64	71	71	99	65	75	64
35W120.2	Natural	0	-37	-43	0	-42	-43	0	-36	-43
35W121.1	Circular	76	118	90	78	117	124	99	110	90
35W121.2	Natural	0	-39	-43	0	-43	-43	0	-43	-42
35W122.1	Circular	73	117	90	76	97	124	101	111	90
35W122.2	Circular	0	0	0	0	0	0	0	0	0
35W200.1	Circular	12	17	18	12	17	18	12	17	18
35W200.2	Natural	0	2	15	0	2	14	0	2	14
35W201.1	Circular	19	27	30	19	27	30	19	27	30
35W201.2	Natural	0	9	30	0	9	30	0	9	30
35W202.1	Circular	25	34	35	25	34	35	25	34	35
35W202.2	Natural	0	4	30	0	3	30	0	4	30
35W203.1	Circular	29	36	36	29	37	36	29	36	36
35W203.2	Natural	0	9	40	0	8	40	0	9	40
35W204.1	Circular	16	20	16	21	15	15	20	16	18
35W204.2	Natural	1	2	-13	2	-8	-16	5	4	-13
35W205.1	Circular	20	31	16	24	26	38	41	28	-17
35W205.2	Natural	0	20	29	0	18	33	6	26	-37
35W206.1	Circular	4	6	10	6	7	10	4	6	10
35W206.2	Natural	0	0	0	0	0	0	0	0	0
35W207.1	Circular	11	17	20	13	17	19	11	17	20
35W207.2	Natural	0	1	8	0	3	10	0	1	8
35W208.1	Circular	16	23	18	17	22	17	16	23	17
35W208.2	Natural	0	16	42	3	23	32	0	17	45
35W209.1	Circular	16	23	21	17	20	19	16	23	21
35W209.2	Natural	0	49	50	18	49	52	0	48	52
36" 46_4A	Circular	36	39	42	36	39	43	36	39	41
36" 46_4B	Circular	36	39	42	36	39	43	36	39	43
36" 46_M	Circular	38	42	42	37	42	44	38	42	42
36" 47_2	Circular	3	6	13	3	6	14	3	6	12
36" 47_3	Circular	13	24	37	13	24	36	13	24	41
36" 47_4	Circular	25	45	73	26	45	73	25	45	73
36" 47_4A	Circular	-25	-45	-73	-26	-45	-73	-25	-45	-73
36" 47_4B	Circular	25	45	73	26	45	73	25	45	73
36" 47_CL	Circular	21	35	61	22	35	61	21	35	60
36" 47_CLA	Circular	26	45	73	27	45	73	26	45	73
36" 49_4A	Circular	52	51	49	52	51	49	52	51	49
42" 43_5	Circular	44	49	56	44	49	56	44	49	56
42" 44_5	Circular	42	43	44	41	45	44	42	44	43
42" 44_5A	Circular	40	38	40	40	38	40	40	38	40
42" 5_43AD	Circular	45	50	57	45	50	57	45	50	57
4-24-25-St	Natural	0	55	168	0	50	167	0	45	167
47TH_TRAP	Natural	6	79	132	4	80	132	2	79	132
48" 45_5	Circular	53	70	55	54	54	55	54	54	55
48" 46_5	Circular	56	49	54	55	50	54	57	50	54
48" 46_5A	Circular	90	89	84	90	88	84	90	88	84
48" 5_46M	Circular	91	91	85	92	89	85	92	89	85
54" 47_5	Circular	99	102	111	99	102	111	99	102	110
54" 48_5	Circular	127	138	141	127	138	141	127	138	141

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
57" 49_5	Circular	169	178	189	169	178	189	169	178	189
5th-24-25.	Natural	0	0	0	0	0	0	0	0	0
6" 50_BE	Natural	0	3	7	0	3	7	0	3	7
9" 44_BL	Circular	0	0	0	0	0	0	0	0	0
9" 44_WE	Circular	-2	-2	-1	-2	-2	-1	-2	-2	-1
9" 45_PL2	Natural	0	0	0	0	0	0	0	0	0
9" 48_BL	Circular	0	0	-1	0	0	-1	0	0	-1
9" 49_5M	Circular	1	1	-1	1	1	-1	1	1	-1
9"44_BL A	Circular	0	0	0	0	0	0	0	0	0
BLVD 4_PO	Natural	0	0	0	0	0	0	0	0	0
BLVD 43_3	Natural	0	0	0	0	0	0	0	0	0
BLVD 43_4	Natural	0	0	0	0	0	0	0	0	0
BLVD 43_5	Natural	0	0	0	0	0	0	0	0	0
BLVD 43_CL	Natural	0	0	0	0	0	0	0	0	0
BLVD 43_PO	Natural	0	0	0	0	0	0	0	0	0
BLVD 44_2	Natural	0	0	0	0	0	0	0	0	0
BLVD 44_3	Natural	0	0	6	0	0	7	0	0	7
BLVD 44_3A	Natural	0	1	12	0	1	12	0	1	12
BLVD 44_4	Natural	0	0	0	0	0	0	0	0	0
BLVD 44_4A	Natural	0	0	0	0	0	0	0	0	0
BLVD 44_5	Natural	1	6	12	1	5	12	1	5	12
BLVD 44_5A	Natural	0	0	0	0	0	0	0	0	0
BLVD 44_CL	Natural	0	0	0	0	0	0	0	0	0
BLVD 44_PO	Natural	3	12	29	3	11	29	2	11	29
BLVD 45_4	Natural	0	0	0	0	0	0	0	0	0
BLVD 45_5	Natural	0	0	0	0	0	0	0	0	0
BLVD 45_CL	Natural	0	0	0	0	0	0	0	0	0
BLVD 46_3	Natural	0	0	0	0	0	0	0	0	0
BLVD 46_3A	Natural	0	0	0	0	0	0	0	0	0
BLVD 46_4	Natural	0	0	2	0	0	2	0	0	2
BLVD 46_M	Natural	0	0	19	0	0	19	0	0	19
BLVD 46_PO	Natural	0	1	9	0	1	9	0	1	9
BLVD 48_1	Natural	0	0	0	0	0	0	0	0	0
BLVD 48_5	Natural	0	0	0	0	0	0	0	0	0
BLVD 48_5M	Natural	0	0	0	0	0	0	0	0	0
BLVD 48_BL	Natural	0	0	0	0	0	0	0	0	0
BLVD 48_PO	Natural	0	0	0	0	0	0	0	0	0
BLVD 48_WE	Natural	0	0	0	0	0	0	0	0	0
BLVD 48-NI	Natural	0	1	7	0	1	7	0	1	7
BLVD 49_1.	Natural	0	0	1	0	0	1	0	0	1
BLVD 49_4	Natural	0	0	-3	0	0	-3	0	0	-3
BLVD 49_5	Natural	0	0	0	0	0	0	0	0	0
BLVD 49_5M	Natural	0	0	0	0	0	0	0	0	0
BLVD 49_NI	Natural	0	0	0	0	0	0	0	0	0
BLVD 49_ST	Natural	6	-51	113	6	-49	141	6	-43	132
BLVD 50_BE	Natural	0	0	0	0	0	0	0	0	0
BLVD 50_NI	Natural	0	0	0	0	0	0	0	0	0
BLVD BE_50	Natural	0	0	0	0	0	0	0	0	0
BLVD BE_61	Natural	0	0	0	0	0	0	0	0	0
BLVD R53	Natural	0	0	0	0	0	0	0	0	0
BLVD43_2	Natural	0	0	0	0	0	0	0	0	0

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
BLVD43_3	Natural	0	1	6	0	1	6	0	1	6
BLVD44_3 M	Natural	0	0	0	0	0	0	0	0	0
BLVD44_5 B	Natural	1	5	15	1	5	15	1	5	15
BLVD44_CL	Natural	0	0	0	0	0	0	0	0	0
BLVD44_PO	Natural	0	3	15	0	2	15	0	2	15
BLVD44_POA	Natural	0	2	12	0	2	12	0	2	12
BLVD44CL_M	Natural	0	0	0	0	0	0	0	0	0
BLVD45_CL	Natural	0	0	0	0	0	0	0	0	0
BLVD45_CLA	Natural	0	0	0	0	0	0	0	0	0
BLVD46_4A	Natural	0	0	1	0	0	1	0	0	1
BLVD46_4B	Natural	0	0	1	0	0	1	0	0	1
BLVD46_5	Natural	6	17	22	6	17	22	6	17	22
BLVD46_CL	Natural	1	5	21	1	5	21	1	4	21
BLVD46_CLA	Natural	0	0	-12	0	0	-14	0	0	-12
BLVD46_PO	Natural	0	0	5	0	0	5	0	0	5
BLVD46_POA	Natural	0	0	-10	0	0	-10	0	0	-10
BLVD48_BLM	Natural	0	0	-7	0	0	-7	0	0	-7
BLVD48_NIA	Natural	0	0	0	0	0	0	0	0	0
BLVD48_PO	Natural	0	0	0	0	0	0	0	0	0
BLVD48_POA	Natural	0	0	-1	0	0	-1	0	0	-1
BLVD49_5MI	Natural	0	0	0	0	0	0	0	0	0
BLVD49_STB	Natural	14	58	437	11	73	477	10	56	450
BLVD49_STE	Natural	5	-21	-111	4	-23	-111	3	-20	-111
BLVD5_43AD	Natural	0	0	0	0	0	0	0	0	0
BLVD50_NIA	Natural	0	0	0	0	0	0	0	0	0
BLVDST_49F	Natural	0	0	0	0	0	0	0	0	0
BVLD 48_NI	Natural	0	-4	-21	0	-4	-21	0	-4	-22
BVLD 49_2	Natural	0	0	0	0	0	0	0	0	0
BVLD 49_3	Natural	0	0	0	0	0	0	0	0	0
BVLD 49_CL	Natural	0	0	0	0	0	0	0	0	0
BVLD49_2M	Natural	0	0	0	0	0	0	0	0	0
BVLD49_3A	Natural	0	0	0	0	0	0	0	0	0
BVLD49_4A	Natural	0	0	0	0	0	0	0	0	0
L100-1	Circular	10	8	8	10	8	8	10	8	8
L100-2	Natural	7	17	33	7	17	33	7	17	33
L101-1	Circular	7	7	6	7	7	6	7	7	6
L101-2	Natural	5	12	23	6	12	23	6	12	23
L102-1	Circular	8	8	8	8	8	8	8	8	8
L102-2	Natural	2	8	18	2	8	18	2	8	18
L103-1	Circular	7	7	7	-11	6	7	-10	7	7
L103-2	Natural	4	11	21	4	11	21	5	11	21
L104-1	Circular	6	6	6	-7	6	6	-7	6	6
L104-2	Natural	0	2	8	0	2	8	0	2	8
L105-1	Circular	3	-4	3	4	-4	3	3	3	3
L105-2	Natural	0	-2	-4	-1	-2	-4	0	-2	-4
L106-1	Circular	2	2	-2	2	2	-2	2	2	2
L106-2	Natural	1	1	3	1	1	3	0	1	3
L107-1	Circular	4	5	5	4	4	4	4	3	5
L107-2	Natural	-25	-44	35	-23	44	31	-23	-45	29
L108-1	Circular	22	20	22	21	20	22	21	21	22
L108-2	Natural	58	88	82	55	89	90	56	86	87

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
L109-1	Circular	23	23	23	23	23	24	23	23	23
L109-2	Natural	22	64	72	20	64	79	21	63	75
L1-1	Circular	6	6	6	6	6	6	6	6	6
L1-1.1	Circular	2	4	4	2	4	4	2	4	4
L110-1	Circular	26	26	25	26	26	25	26	26	25
L110-2	Natural	13	22	70	13	22	72	13	22	72
L11-1	Circular	20	21	22	20	21	22	20	21	22
L111-1	Circular	31	34	36	31	34	36	31	34	36
L111-2	Natural	0	0	0	0	0	0	0	0	0
L11-2	Natural	0	2	25	0	2	25	0	2	25
L112-1	Circular	25	28	29	25	28	29	25	28	29
L112-2	Natural	0	0	0	0	0	0	0	0	0
L113-1	Circular	5	5	6	5	5	6	5	5	6
L113-2	Natural	0	0	0	0	0	0	0	0	0
L114-1	Circular	5	6	5	5	5	5	5	5	5
L114-2	Natural	0	1	13	0	0	11	0	1	11
L115-1	Circular	4	4	4	4	4	4	4	4	4
L115-2	Natural	0	1	-7	0	1	-6	0	1	-6
L116-1	Circular	3	3	3	2	3	3	2	3	3
L116-2	Natural	0	2	8	0	2	7	0	1	6
L118-1	Circular	8	8	8	8	8	8	8	8	8
L118-2	Natural	1	7	16	1	7	16	1	7	16
L1-2	Natural	4	10	19	4	10	19	4	10	19
L1-2.2	Natural	0	0	0	0	0	0	0	0	0
L12-1	Circular	28	36	44	28	36	44	28	36	44
L12-2	Natural	0	0	26	0	0	25	0	0	26
L124-1	Circular	13	10	10	13	10	10	13	10	10
L124-2	Natural	6	24	69	6	24	77	6	24	76
L125-1	Circular	12	13	11	10	13	11	12	13	11
L125-2	Natural	0	5	-60	0	5	-70	0	5	-61
L126-1	Circular	27	28	29	26	28	29	27	28	29
L126-2	Natural	0	0	0	0	0	0	0	0	0
L127-1	Circular	28	29	25	28	29	25	28	29	25
L127-2	Natural	3	49	110	3	50	111	3	50	110
L128-1	Circular	12	11	10	12	11	10	11	11	10
L128-2	Natural	6	20	41	6	20	41	6	20	41
L129-1	Circular	11	11	10	11	11	10	11	11	10
L129-2	Natural	1	15	37	1	15	37	1	15	37
L130-1	Circular	10	14	15	10	14	15	10	14	15
L130-2	Natural	0	0	12	0	0	12	0	0	13
L13-1	Circular	28	35	52	28	35	51	28	35	51
L131-1	Circular	5	8	7	5	8	7	5	8	7
L131-2	Natural	0	1	9	0	1	9	0	2	10
L13-2	Natural	0	0	0	0	0	0	0	0	0
L132-1	Circular	5	7	6	5	7	6	5	7	6
L132-2	Natural	0	4	12	0	4	11	0	5	12
L133-1	Circular	6	3	2	6	3	2	6	3	2
L133-2	Natural	4	8	6	4	8	6	4	8	6
L135-1	Circular	36	47	50	37	48	51	43	65	93
L135-2	Natural	0	0	-27	0	0	0	0	0	0
L136-1	Circular	7	7	7	7	7	7	7	7	7

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
L136-2	Natural	20	35	59	21	35	59	24	39	66
L137-1	Circular	29	28	26	30	29	27	30	28	25
L137-2	Natural	3	18	44	3	18	44	3	18	44
L14-1	Circular	39	48	47	39	55	55	39	57	57
L14-2	Natural	0	87	223	0	78	220	0	70	220
L150-1	Circular	17	45	49	12	18	38	12	14	47
L150-2	Natural	0	63	-167	0	0	117	0	0	0
L15-1	Circular	38	54	54	40	64	64	39	68	68
L15-2	Natural	0	53	206	0	33	179	0	22	178
L157-1	Circular	221	239	245	205	226	234	189	211	213
L157-2	Natural	0	0	128	0	0	124	0	0	38
L158-1	Circular	18	18	18	15	15	15	15	15	15
L158-2	Natural	24	48	85	30	52	89	29	56	96
L159-1	Circular	34	34	34	33	34	33	43	64	66
L159-2	Natural	2	41	80	8	48	91	0	3	77
L1680	Circular	12	13	13	12	12	13	12	12	13
L1681	Circular	12	13	14	12	13	14	12	13	13
L17	Circular	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	38	70	102
L18-1	Circular	78	94	137	68	100	108	66	75	76
L18-2	Natural	0	0	0	0	-44	-204	0	0	27
L19-1	Circular	11	13	14	11	13	15	11	13	15
L19-2	Natural	0	0	0	0	0	0	0	0	0
L20-1	Circular	12	13	14	11	13	15	11	13	15
L20-2	Natural	0	0	0	0	0	0	0	0	0
L21-1	Circular	12	13	14	11	13	15	11	13	15
L21-2	Natural	0	0	0	0	0	0	0	0	0
L22-1	Circular	12	15	14	12	19	21	11	13	27
L22-2	Natural	0	31	-32	0	-9	-28	0	0	-24
L23-1	Circular	78	94	137	69	101	128	66	75	76
L23-2	Natural	0	0	0	0	0	-184	0	0	0
L232-1	Circular	44	70	80	45	72	81	36	85	128
L232-2	Natural	0	0	50	0	0	52	0	0	12
L24-1	Circular	8	8	8	8	8	8	8	8	8
L24-2	Natural	7	11	21	7	11	21	7	11	21
L25-1	Circular	18	23	21	18	23	21	18	23	21
L25-2	Natural	13	37	72	14	37	72	14	37	72
L25863-3O	Natural	1	131	461	1	132	459	0	132	460
L26-1	Circular	21	24	24	21	24	24	21	24	24
L26-2	Natural	0	27	64	0	27	64	0	27	64
L27-1	Circular	32	36	36	32	36	36	32	36	36
L27-2	Natural	0	37	113	0	37	113	0	37	113
L28-1	Circular	32	42	43	32	42	43	32	42	43
L28-2	Natural	0	28	104	0	28	104	0	28	104
L29-1	Circular	48	49	49	48	49	49	48	49	49
L29-2	Natural	49	105	241	49	105	241	49	105	242
L30-1	Circular	53	53	53	53	53	53	53	53	53
L30-2	Natural	31	87	225	31	87	225	31	87	225
L3-1	Circular	13	11	11	13	11	11	13	11	11
L31-1	Circular	63	63	63	63	63	63	63	63	63
L31-2	Natural	27	100	257	27	100	257	27	100	258
L3-2	Natural	13	29	54	13	29	54	13	29	54

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
L32-1	Circular	87	94	95	87	96	96	87	97	97
L32-2	Natural	0	30	114	0	27	113	0	25	114
l350-0	Natural	#N/A	#N/A	#N/A	0	0	53	0	0	69
L35-1	Circular	87	96	96	87	101	100	87	105	104
L35-2	Natural	0	0	59	0	0	52	0	0	52
L359-3	Natural	5	20	44	6	20	44	6	20	44
L36-1	Circular	55	61	52	55	61	56	57	62	61
L36-2	Natural	0	53	156	0	48	149	0	43	151
L37-1	Circular	36	36	34	37	39	36	38	42	41
L37-2	Natural	0	53	121	0	53	120	0	53	120
L38-1	Circular	37	40	35	37	40	36	38	40	37
L38-2	Natural	7	66	131	3	66	131	1	66	132
L39-1	Circular	16	16	16	16	16	16	16	16	16
L39-2	Natural	8	25	48	8	25	48	8	25	48
L398	Circular	3	3	4	3	3	4	3	3	4
L40-1	Circular	92	147	165	84	114	149	74	86	89
L40-2	Natural	0	0	-132	0	0	106	0	0	-2
L408.1	Circular	51	54	70	51	54	71	51	54	70
L40TH-1	Circular	398	454	516	402	454	517	404	454	517
L40TH-2	Natural	0	0	325	0	0	325	0	0	325
L4-1	Circular	20	20	20	20	20	20	20	20	20
L41-1	Circular	228	256	293	213	245	278	196	229	250
L41-2	Natural	0	0	0	0	0	0	0	0	0
L4-2	Natural	1	12	26	1	12	26	1	12	26
L42ND-1.1	Circular	379	437	431	383	438	431	385	437	431
L42ND-2.1	Natural	0	0	633	0	87	700	0	120	589
L43-1	Circular	22	21	-10	22	22	10	23	20	10
L43-2	Natural	0	5	18	0	5	18	0	5	18
L43RD-1-1	Circular	282	-431	-435	278	292	301	283	-431	-434
L43RD-1-2	Natural	56	700	786	0	0	0	148	700	783
L43RD-2-1	Circular	274	259	270	279	307	340	271	258	269
L43RD-2-2	Natural	170	227	266	0	0	0	174	227	267
L43RD-3-1	Circular	274	259	319	279	326	354	272	261	318
L43RD-3-2	Natural	0	0	675	0	0	0	0	0	0
L44-1	Circular	26	25	17	26	26	17	27	24	17
L44-2	Natural	0	3	14	0	3	14	0	3	14
L443	Circular	2	2	2	2	2	2	2	2	2
L44TH-1	Circular	245	310	340	238	282	271	245	309	337
L44TH-2	Natural	0	0	0	0	0	0	0	0	0
L450	Circular	1	2	2	1	2	2	1	2	2
L451	Circular	1	2	2	2	1	2	2	2	2
L45-1	Circular	26	25	17	26	26	17	27	24	17
L45-2	Natural	0	1	9	0	0	9	1	0	9
L45TH-1	Circular	236	287	305	228	250	243	237	286	303
L45TH-2	Natural	0	0	0	0	0	0	0	0	0
L46-1	Circular	43	43	42	43	43	43	43	43	43
L46-2	Natural	2	32	85	3	32	85	2	32	85
L474	Circular	2	2	2	2	2	2	2	2	2
L477	Circular	4	4	4	4	4	4	4	4	4
L48	Circular	0	0	0	0	0	0	0	0	0
L49-1	Circular	16	20	15	16	20	15	17	20	15

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
L49-2	Natural	6	25	54	6	25	54	6	25	54
L497	Circular	2	2	2	2	2	2	2	2	2
L49TH_DI	Circular	0	54	77	0	54	77	0	54	77
L50-1	Circular	37	44	30	37	44	30	37	44	30
L50-2	Natural	22	80	171	23	80	171	22	81	171
L506	Circular	2	2	2	2	2	2	2	2	2
L507	Circular	2	2	2	2	2	2	3	2	2
L508	Circular	2	2	2	2	2	2	2	2	2
L5-1	Circular	28	36	37	28	36	38	28	36	38
L51-1	Circular	33	31	29	33	31	28	34	31	29
L51-2	Natural	15	71	164	16	71	164	14	71	164
L5-2	Natural	0	0	42	0	0	42	0	0	42
L520	Circular	5	5	6	5	5	6	5	5	6
L52-1	Circular	55	49	46	55	48	46	55	49	46
L52-2	Natural	25	106	228	26	106	227	24	107	228
L53-1	Circular	52	54	53	52	54	53	52	54	53
L53-2	Natural	9	86	213	10	87	213	8	87	213
L538	Circular	3	3	3	3	3	3	3	3	3
L54-1	Circular	58	48	60	56	48	60	56	49	60
L54-2	Natural	34	132	287	34	133	286	33	133	286
L545	Circular	3	3	2	3	3	2	3	3	2
L546	Natural	0	0	1	0	0	1	0	0	1
L55-1	Circular	-138	-135	-130	-136	-132	-130	-134	-131	-130
L55-2	Natural	109	318	619	115	320	621	108	315	613
L557	Natural	0	0	0	0	0	0	0	0	0
L56-1	Circular	161	160	141	161	158	142	160	158	141
L56-2	Natural	10	285	584	18	288	586	8	282	579
L563	Circular	2	1	1	2	1	1	2	1	1
L564	Natural	4	9	16	4	9	16	4	9	16
L565	Natural	3	8	15	3	8	15	3	8	15
L566	Circular	3	3	4	3	3	4	3	3	4
L569	Circular	1	1	1	1	1	1	1	1	1
L57-1	Circular	-172	-183	-171	-174	-189	-172	-171	-189	-170
L57-2	Natural	0	327	619	0	329	619	0	323	615
L576	Natural	2	7	14	2	7	14	2	7	14
L577	Natural	0	3	14	0	3	14	0	3	14
L578	Natural	2	8	15	2	8	15	2	8	15
L579	Circular	0	1	3	0	1	3	0	1	3
L58-1	Circular	172	205	179	174	206	179	171	207	179
L58-2	Natural	0	295	564	0	298	563	0	291	561
L587	Natural	0	0	0	0	0	0	0	0	0
L589	Circular	1	1	2	1	1	2	1	1	2
L59-1	Circular	181	282	284	184	282	283	180	282	283
L59-2	Natural	0	201	508	0	206	507	0	194	509
L594	Natural	1	4	10	1	4	10	1	4	10
L595	Natural	2	7	12	2	7	12	2	7	12
L596	Natural	2	6	12	2	6	12	2	6	12
L597	Natural	1	4	9	1	4	9	1	4	9
L598	Natural	1	4	8	1	3	8	1	3	8
L600	Natural	0	1	4	0	1	4	0	1	4
L60-1	Circular	181	384	451	184	386	452	180	382	450

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
L60-2	Natural	0	0	0	0	0	0	0	0	0
L606	Natural	1	3	7	1	3	7	0	3	7
L607	Natural	0	0	-4	0	0	-4	0	0	-4
L6-1	Circular	33	36	35	33	38	38	33	40	40
L610	Natural	4	5	7	4	5	7	4	5	7
L611	Natural	0	0	0	0	0	0	0	0	0
L61-1	Circular	181	296	341	183	297	342	180	295	344
L61-2	Natural	0	0	0	0	0	0	0	0	0
L6-2	Natural	0	24	41	0	23	41	0	23	41
L62-1	Circular	446	570	654	431	557	647	421	532	628
L62-2	Natural	0	0	0	0	0	0	0	0	0
L63	Circular	56	78	92	56	78	92	56	78	92
L65	Circular	117	135	148	117	135	147	116	135	147
L66-1	Circular	40	54	65	40	54	65	40	54	65
L66-2	Natural	0	0	0	0	0	0	0	0	0
L67-1	Circular	40	54	61	40	54	61	40	54	61
L67-2	Natural	0	0	-21	0	0	-21	0	0	-21
L68-1	Circular	30	38	50	30	38	47	30	38	49
L68-2	Natural	0	0	51	0	0	51	0	0	51
L69-1	Circular	30	33	33	30	33	33	30	33	33
L69-2	Natural	0	13	32	0	13	32	0	13	32
L7009A	Circular	-57	-148	-191	-55	-147	-190	-57	-147	-191
L70-1	Circular	16	19	19	16	19	19	16	19	19
L70-2	Natural	0	9	13	0	9	13	0	9	13
L71-1	Circular	16	18	19	16	18	19	16	18	19
L71-2	Natural	0	0	0	0	0	0	0	0	0
L72-1	Circular	9	16	17	8	16	17	8	16	17
L72-2	Natural	0	0	-2	0	0	-2	0	0	-2
L73-1	Circular	4	6	5	4	6	6	4	5	10
L73-2	Natural	0	4	-7	0	4	-7	0	4	-7
L74-1	Circular	4	4	3	4	4	3	4	4	3
L74-2	Natural	0	5	9	0	5	9	0	5	9
L75-1	Circular	27	36	36	27	36	36	26	36	35
L75-2	Natural	0	0	0	0	0	0	0	0	0
L76-1	Circular	27	36	36	27	36	36	26	36	36
L76-2	Natural	0	0	0	0	0	0	0	0	0
L78	Circular	0	0	0	0	0	0	0	0	0
L79	Circular	0	0	0	0	0	0	0	0	0
L80	Circular	0	0	0	0	0	0	0	0	0
L81-1	Circular	90	123	132	90	122	132	90	123	132
L81-2	Natural	0	0	0	0	0	0	0	0	0
L82-1	Circular	78	102	102	78	101	103	78	101	103
L82-2	Natural	0	92	131	0	90	137	0	92	132
L83-1	Circular	46	43	43	46	43	44	46	43	44
L83-2	Natural	-1	-86	-132	-1	-86	-133	0	-86	-132
L84-1	Circular	38	39	39	37	39	39	38	39	39
L84-2	Natural	0	-81	-117	0	-86	-120	0	-82	-112
L85-1	Circular	33	34	34	33	34	34	33	34	34
L85-2	Natural	23	81	170	23	81	170	23	81	170
L86-1	Circular	36	36	36	36	36	36	36	36	36
L86-2	Natural	20	75	163	19	75	163	19	75	163

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
L87-1	Circular	26	25	25	26	25	25	26	25	25
L87-2	Natural	29	66	124	29	66	124	29	66	124
L88-1	Circular	26	24	24	26	24	24	26	24	24
L88-2	Natural	24	60	118	24	60	118	24	60	118
L89-1	Circular	18	17	16	18	17	16	18	17	16
L89-2	Natural	21	45	84	21	45	84	21	45	84
L90-1	Circular	13	11	8	13	11	8	13	11	8
L90-2	Natural	11	22	40	11	22	40	11	22	40
L9-1	Circular	11	11	11	11	11	11	11	11	11
L91-1	Circular	9	9	8	9	9	8	9	9	8
L91-2	Natural	12	23	40	12	23	40	12	23	40
L9-2	Natural	0	5	16	0	5	15	0	5	16
L92-1	Circular	43	42	39	43	42	39	43	42	39
L92-2	Natural	31	78	169	32	80	172	29	75	163
L93-1	Circular	36	36	28	33	28	28	36	31	34
L93-2	Natural	29	65	130	30	65	130	30	64	130
L94-1	Circular	31	29	28	32	29	28	32	29	29
L94-2	Natural	22	55	120	23	55	120	23	55	120
L95-1	Circular	21	21	21	22	21	21	22	22	21
L95-2	Natural	24	50	98	24	50	98	24	50	98
L96-1	Circular	22	21	21	22	21	21	22	22	22
L96-2	Natural	24	49	97	24	49	96	25	49	97
L97-1	Circular	10	8	8	10	8	8	10	8	8
L97-2	Natural	8	18	34	8	18	34	8	18	34
L99-1	Circular	9	8	8	9	8	8	9	8	8
L99-2	Natural	8	17	32	8	17	32	8	17	32
LB5565-1	Circular	224	239	249	210	-216	182	229	238	-255
LB5565-2	Natural	0	-4	-43	0	-43	-43	0	-4	-43
LC5429	Circular	23	54	64	32	61	66	23	54	64
LC5430	Circular	26	54	78	30	67	92	28	54	78
LD6172-1	Circular	9	10	11	9	10	11	9	10	11
LD6172-2	Natural	0	0	-8	0	0	-8	0	0	-8
LD6504-1	Circular	2	3	5	2	3	5	2	3	5
LD6504-2	Natural	0	0	-4	0	0	-4	0	0	-4
LD6572-1	Circular	20	24	26	20	24	26	20	24	26
LD6572-2	Natural	0	0	2	0	0	3	0	0	3
LD6591-1	Circular	3	4	7	3	4	7	3	4	7
LD6591-2	Natural	0	0	0	0	0	2	0	0	0
LD6616-1	Circular	3	4	6	3	4	6	3	4	6
LD6616-2	Natural	0	0	-5	0	0	-6	0	0	-5
LD6667-1	Circular	6	10	15	6	10	15	6	10	15
LD6667-2	Natural	0	0	3	0	0	3	0	0	3
LD6706-1	Circular	3	41	48	3	29	52	3	28	84
LD6706-2	Natural	0	-3	-16	0	-4	-16	0	-3	-15
LD6708-1	Circular	25	33	37	25	33	37	25	33	37
LD6708-2	Natural	0	0	9	0	0	10	0	0	10
LD6720-1	Circular	9	14	17	9	14	17	9	14	17
LD6720-2	Natural	0	0	0	0	0	0	0	0	0
LD6751-1	Circular	6	10	15	6	10	15	6	10	15
LD6751-2	Natural	0	0	2	0	0	2	0	0	2
LD6761-1	Circular	5	39	73	5	28	65	5	26	83

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LD6761-2	Natural	0	-1	-33	0	-1	-33	0	-1	-33
LD6774-1	Circular	29	39	46	29	39	46	29	39	46
LD6774-2	Natural	0	0	0	0	0	0	0	0	0
LD6776-1	Circular	38	53	62	38	53	62	38	53	62
LD6776-2	Natural	0	0	0	0	0	0	0	0	0
LD6813-1	Circular	57	91	92	57	97	92	57	84	92
LD6813-2	Natural	0	24	76	0	25	75	0	25	76
LD6818-1	Circular	45	63	72	45	63	74	45	63	73
LD6818-2	Natural	0	0	0	0	0	0	0	0	0
LD6844-1	Circular	7	11	19	7	11	19	7	11	18
LD6844-2	Natural	0	0	0	0	0	0	0	0	0
LD6847-1	Circular	123	181	198	123	182	198	123	182	198
LD6847-2	Natural	0	0	0	0	0	0	0	0	0
LD6852-1	Circular	120	172	186	120	173	186	120	172	185
LD6852-2	Natural	0	0	60	0	0	59	0	0	60
LD6853-1	Circular	122	178	195	122	179	195	122	178	195
LD6853-2	Natural	0	0	0	0	0	0	0	0	0
LD6857-1	Circular	63	102	153	63	106	153	63	103	153
LD6857-2	Natural	0	0	-2	0	0	-2	0	0	-2
LD6865-1	Circular	109	159	176	109	160	176	109	159	176
LD6865-2	Natural	0	0	0	0	0	0	0	0	0
LD6894-1	Circular	109	159	177	109	161	176	109	160	176
LD6894-2	Natural	0	0	41	0	0	41	0	0	41
LD6948-1	Circular	11	19	23	11	19	23	11	19	22
LD6948-2	Natural	0	0	22	0	0	22	0	0	22
LD6953-1	Circular	122	181	198	122	182	198	122	182	198
LD6953-2	Natural	0	0	0	0	0	0	0	0	0
LD7121-1	Circular	128	201	216	128	201	216	128	201	216
LD7121-2	Natural	0	0	0	0	0	0	0	0	0
LD7150-1	Circular	48	73	81	48	73	81	48	73	82
LD7150-2	Natural	0	0	36	0	0	35	0	0	36
LD7163-1	Circular	9	15	16	9	15	16	9	15	16
LD7163-2	Natural	0	3	15	0	3	15	0	3	15
LD7165-1	Circular	9	12	12	9	12	12	9	12	12
LD7165-2	Natural	0	11	23	0	11	23	0	11	23
LD7170-1	Circular	3	8	13	3	8	13	3	8	13
LD7170-2	Natural	0	0	0	0	0	0	0	0	0
LD7176-1	Circular	132	212	226	132	212	226	132	212	226
LD7176-2	Natural	0	0	0	0	0	0	0	0	0
LD7181-1	Circular	36	55	59	36	55	59	36	55	59
LD7181-2	Natural	0	2	49	0	3	49	0	3	49
LD7185-1	Circular	29	44	44	29	44	44	29	44	44
LD7185-2	Natural	0	5	21	0	5	21	0	5	21
LD7185-3	Natural	0	8	35	0	9	35	0	9	35
LD7264-1	Circular	-20	-31	-33	-20	-31	-33	-20	-31	-33
LD7264-2	Natural	0	8	35	0	8	35	0	8	35
LD7436-1	Circular	139	236	266	139	236	266	139	236	266
LD7436-2	Natural	0	0	0	0	0	0	0	0	0
LD7476-1	Circular	139	236	266	139	236	266	139	236	266
LD7476-2	Natural	0	0	0	0	0	0	0	0	0
LD7521-1	Circular	138	236	266	138	237	266	138	236	266

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LD7521-2	Natural	0	0	0	0	0	0	0	0	0
LD7539-1	Circular	3	7	6	3	7	6	3	7	6
LD7539-2	Natural	0	0	3	0	1	3	0	1	3
LD7552-1	Circular	16	23	21	16	23	21	16	23	21
LD7552-2	Natural	0	10	30	0	10	30	0	10	30
LD7588-1	Circular	138	236	266	138	236	266	138	236	266
LD7588-2	Natural	0	0	0	0	0	0	0	0	0
LD7746-1	Circular	3	5	6	3	5	6	3	5	6
LD7746-2	Natural	0	0	2	0	0	2	0	0	2
LD7886-1	Circular	5	7	7	5	7	7	5	7	7
LD7886-2	Natural	0	0	5	0	0	5	0	0	5
LDS1-1	Circular	701	805	861	697	805	870	704	811	878
LDS12	Circular	709	727	776	705	729	778	706	732	781
LDS13	Circular	724	739	787	720	740	789	721	744	793
LDS14	Circular	870	865	892	871	868	900	871	866	891
LDS15	Circular	892	911	987	886	899	976	890	908	988
LDS16-1	Circular	977	1059	1106	972	1055	1095	976	1061	1121
LDS16-2	Natural	0	0	0	0	0	0	0	0	0
LDS3(31ST)	Circular	1255	1247	1275	1251	1259	1260	1264	1256	1300
LDS4(27TH)	Circular	1527	1697	1755	1532	1694	1755	1539	1678	1729
LDS6	Circular	2659	2913	3020	2668	2911	3015	2663	2910	3015
LDS7	Circular	2804	3195	3458	2809	3195	3456	2798	3195	3460
LDS8	Circular	2804	3195	3458	2808	3195	3455	2799	3194	3460
LDS9	Circular	2806	3195	3458	2809	3195	3455	2800	3194	3460
LG7878-1	Special	63	63	60	63	63	60	63	63	60
LG7878-2	Natural	0	0	-24	0	0	-24	0	0	-24
LG7893-1	Circular	61	61	59	61	61	59	61	61	59
LG7893-2	Natural	0	0	0	0	0	0	0	0	0
LG7903-1	Circular	59	61	55	59	61	55	59	61	55
LG7903-2	Natural	0	0	0	0	0	0	0	0	0
LG7922-1	Circular	67	69	71	67	69	71	67	69	71
LG7922-2	Natural	0	0	0	0	0	0	0	0	0
LG7944-1	Circular	4	7	9	4	7	9	4	7	9
LG7944-2	Natural	0	0	-19	0	0	-19	0	0	-19
LG7955-1	Circular	59	60	55	59	60	54	59	60	54
LG7955-2	Natural	0	0	-10	0	0	-10	0	0	-10
LG7985-1	Circular	57	57	53	57	57	53	57	57	53
LG7985-2	Natural	0	0	13	0	0	13	0	0	13
LG7985-4	Natural	23	138	314	23	138	314	23	138	315
LG8163-1	Circular	37	48	78	37	48	79	37	48	78
LG8163-2	Natural	0	0	0	0	0	0	0	0	0
LG8219-1	Circular	59	59	59	59	59	59	59	59	59
LG8219-2	Natural	15	100	228	15	100	228	15	100	229
LG8248-1	Circular	120	138	151	120	138	152	120	138	151
LG8248-2	Natural	0	0	0	0	0	0	0	0	0
LG8250-1	Circular	155	188	222	155	188	222	155	188	222
LG8250-2	Natural	0	0	0	0	0	0	0	0	0
LG8251-1	Circular	-121	-138	-149	-121	-138	-149	-121	-138	-149
LG8251-2	Natural	0	0	0	0	0	0	0	0	0
LG8252-1	Circular	121	138	150	121	138	150	121	138	150
LG8252-2	Natural	0	0	0	0	0	0	0	0	0

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LG8253-1	Circular	154	188	222	154	188	222	154	188	222
LG8253-2	Natural	0	0	0	0	0	0	0	0	0
LG8254-1	Circular	37	48	54	37	48	54	37	48	54
LG8254-2	Natural	0	0	31	0	0	32	0	0	31
LG8255-1	Circular	154	188	222	154	188	222	154	188	222
LG8255-2	Natural	0	0	0	0	0	0	0	0	0
LG8261-1	Circular	6	6	6	6	6	6	6	6	6
LG8261-2	Natural	0	0	10	0	0	10	0	0	10
LG8261-4	Natural	1	8	29	1	8	29	1	8	29
LG8273-1	Circular	16	15	16	16	15	16	16	15	16
LG8273-2	Natural	9	15	23	9	15	23	9	15	23
LG8275-1	Circular	50	73	79	50	73	76	50	73	77
LG8275-2	Natural	0	10	108	0	10	108	0	10	108
LG8276-1	Circular	46	50	49	46	50	49	46	50	49
LG8276-2	Natural	0	52	118	0	52	117	0	52	118
LG8280-1	Circular	20	19	19	20	19	19	20	19	19
LG8280-2	Natural	1	21	31	1	21	31	1	21	31
LG8326-1	Circular	28	38	37	28	38	37	28	38	37
LG8326-2	Natural	0	5	64	0	6	64	0	6	64
LG8337-1	Circular	23	37	46	23	37	46	23	37	46
LG8337-2	Natural	0	0	-21	0	0	-21	0	0	-21
LG8380-1	Circular	16	16	15	16	16	15	16	16	15
LG8380-2	Natural	11	16	23	11	16	23	11	16	23
LG8430-1	Circular	16	16	16	16	16	16	16	16	16
LG8430-2	Natural	2	4	7	2	4	7	2	4	7
LG8484-1	Circular	51	51	50	51	51	50	51	51	50
LG8484-2	Natural	21	100	218	22	100	217	22	100	218
LG8502-1	Circular	0	0	0	0	0	0	0	0	0
LG8502-2	Natural	0	0	0	0	0	0	0	0	0
LG8580-1	Circular	48	48	47	48	48	47	48	48	47
LG8580-2	Natural	32	111	229	33	111	228	33	111	229
LG8588-1	Circular	0	0	0	0	0	0	0	0	0
LG8588-2	Natural	0	0	0	0	0	0	0	0	0
LG8590-1	Circular	27	27	27	27	27	27	27	27	27
LG8590-2	Natural	16	53	105	16	53	105	16	53	105
LG8592-1	Circular	-5	4	3	-5	4	3	-5	4	3
LG8592-2	Natural	3	8	15	3	8	15	3	8	15
LG8594-1	Circular	26	25	26	26	25	25	26	25	25
LG8594-2	Natural	25	61	113	25	61	113	25	61	113
LG8599-1	Circular	5	9	16	5	9	16	5	9	16
LG8599-2	Natural	0	0	0	0	0	0	0	0	0
LG8600-1	Circular	4	9	16	4	9	16	4	9	16
LG8600-2	Natural	0	0	0	0	0	0	0	0	0
LG8608-1	Circular	29	30	30	29	30	30	29	30	30
LG8608-2	Natural	7	43	96	7	43	96	7	43	96
LG8610-1	Circular	25	25	27	25	25	27	25	25	27
LG8610-2	Natural	17	54	108	17	54	108	17	54	108
LG8611-1	Circular	-45	-45	-45	-45	-45	-45	-45	-45	-45
LG8611-2	Natural	39	118	236	39	118	235	39	118	236
LG8612-1	Circular	35	35	35	35	35	35	35	35	35
LG8612-2	Natural	51	121	226	52	121	226	51	121	227

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LG8615-1	Circular	0	0	0	0	0	0	0	0	0
LG8615-2	Natural	0	0	0	0	0	0	0	0	0
LG8620-1	Circular	20	18	18	20	18	18	20	18	18
LG8620-2	Natural	26	49	85	26	49	85	26	49	85
LG8632-1	Circular	6	6	5	6	6	5	6	6	5
LG8632-2	Natural	30	63	117	30	63	117	30	63	117
LG8678-1	Circular	25	26	26	25	27	26	25	26	26
LG8678-2	Natural	0	22	61	0	23	62	0	22	61
LG8685-1	Circular	8	11	8	8	11	8	8	11	8
LG8685-2	Natural	0	5	15	0	5	15	0	5	15
LG8699-1	Circular	22	22	22	22	22	22	22	22	22
LG8699-2	Natural	2	33	69	2	33	69	2	33	69
LG8710-1	Circular	14	12	12	14	11	13	14	11	13
LG8710-2	Natural	3	15	35	3	15	35	3	15	35
LG8721-1	Circular	18	18	18	18	18	18	18	18	18
LG8721-2	Natural	0	2	5	0	2	5	0	2	5
LG8721-3	Natural	0	2	6	0	2	6	0	2	6
LG8745-1	Circular	21	21	21	21	21	21	21	21	21
LG8745-2	Natural	10	38	75	10	38	74	10	38	75
LG8765-1	Circular	-12	-15	-15	-12	-15	-16	-12	-16	-16
LG8765-2	Natural	1	16	33	2	17	33	2	17	33
LG8768-1	Circular	8	11	8	8	11	8	8	11	8
LG8768-2	Natural	0	5	13	0	5	13	0	5	13
LG8778-1	Circular	23	24	24	23	24	24	23	24	24
LG8778-2	Natural	0	18	63	0	18	63	0	18	63
LG8783-1	Circular	13	19	19	13	19	19	13	19	19
LG8783-2	Natural	0	1	21	0	1	21	0	1	21
LG8783-3	Natural	0	1	18	0	1	18	0	1	18
LG8805-1	Circular	3	5	9	3	5	9	3	5	9
LG8805-2	Natural	0	0	0	0	0	0	0	0	0
LG8817-1	Circular	12	12	13	12	12	13	12	12	13
LG8817-2	Natural	7	18	38	7	18	38	7	18	38
LG8820-1	Circular	0	0	0	0	0	0	0	0	0
LG8820-2	Natural	0	0	0	0	0	0	0	0	0
LG8837-1	Circular	5	5	5	5	5	5	5	5	5
LG8837-2	Natural	27	59	112	27	59	112	27	59	112
LG8872-1	Circular	14	15	15	14	15	15	14	15	15
LG8872-2	Natural	4	14	34	4	14	34	4	14	34
LG9023-1	Circular	14	14	14	14	14	14	14	14	14
LG9023-2	Natural	5	15	35	5	15	35	5	15	35
LG9037-1	Circular	15	20	20	15	20	20	15	20	20
LG9037-2	Natural	0	0	0	0	0	0	0	0	0
LG9043-1	Circular	8	9	9	9	9	9	8	9	9
LG9043-2	Natural	0	5	16	0	5	16	0	5	16
LG9049-1	Circular	15	15	16	15	15	16	15	15	16
LG9049-2	Natural	1	17	40	1	17	40	1	17	40
LG9051-1	Circular	10	15	15	10	15	15	10	15	15
LG9051-2	Natural	0	10	41	0	10	41	0	10	41
LG9053-1	Circular	5	5	5	5	5	5	5	5	5
LG9053-2	Natural	27	60	112	28	60	112	28	60	112
LG9057-1	Circular	15	20	20	15	20	20	15	20	20

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LG9057-2	Natural	0	0	0	0	0	0	0	0	0
LG9066-1	Circular	6	10	10	6	10	10	6	10	10
LG9066-2	Natural	0	0	5	0	0	5	0	0	5
LG9139-1	Circular	5	6	6	5	6	6	5	6	6
LG9139-2	Natural	0	6	12	0	6	12	0	6	12
LG9142-1	Circular	5	8	8	5	8	8	5	8	8
LG9142-2	Natural	0	1	7	0	1	7	0	1	7
LG9143-1	Circular	5	8	8	5	8	8	5	8	8
LG9143-2	Natural	0	1	7	0	1	7	0	1	7
LG9144-1	Circular	11	11	11	11	11	11	11	11	11
LG9144-2	Natural	11	25	50	11	25	50	11	25	50
LG9146-1	Circular	10	9	10	10	10	9	10	9	9
LG9146-2	Natural	12	26	51	12	26	51	12	26	51
LG9147-1	Circular	8	8	7	7	8	7	7	8	7
LG9147-2	Natural	5	12	25	5	12	25	5	12	25
LG9155-1	Circular	14	16	19	14	16	19	14	16	19
LG9155-2	Natural	0	0	0	0	0	0	0	0	0
LG9155-3	Natural	0	0	0	0	0	0	0	0	0
LG9165-1	Circular	9	9	9	9	9	9	9	9	9
LG9165-2	Natural	0	0	0	0	0	0	0	0	0
LG9165-3	Natural	3	11	24	3	11	24	3	11	24
LG9226-1	Circular	11	15	15	11	15	15	11	15	15
LG9226-2	Natural	0	15	46	0	15	46	0	15	46
LG9233-1	Circular	6	5	5	6	5	5	6	5	5
LG9233-2	Natural	25	50	89	26	50	89	26	50	89
LG9270-1	Circular	15	20	21	15	20	21	15	20	21
LG9270-2	Natural	0	0	0	0	0	0	0	0	0
LG9270-3	Natural	0	5	20	0	5	20	0	5	20
LG9274-1	Circular	14	15	15	14	15	15	14	15	15
LG9274-2	Natural	5	20	43	5	20	43	5	20	43
LG9284-1	Circular	8	8	8	8	8	8	8	8	8
LG9284-2	Natural	0	10	21	1	10	21	0	10	21
LG9288-1	Circular	8	8	7	8	8	7	8	8	7
LG9288-2	Natural	1	4	9	1	4	9	1	4	9
LG9288-3	Natural	16	30	53	16	30	53	16	30	53
LG9289-1	Circular	6	10	9	6	10	9	6	10	9
LG9289-2	Natural	0	1	12	0	1	12	0	1	12
LI7111-1	Circular	0	0	0	0	0	0	0	0	0
LI7111-2	Natural	0	0	0	0	0	0	0	0	0
LI7166-1	Circular	0	-2	-2	0	-2	-3	0	-2	-2
LI7166-2	Natural	12	-99	-126	12	-95	-138	12	-95	-138
LI7177-1	Circular	12	19	20	12	19	20	12	19	20
LI7177-2	Natural	0	0	-6	0	0	-6	0	0	-6
LI7258-1	Circular	0	0	0	0	0	0	0	0	0
LI7258-2	Natural	0	0	0	0	0	0	0	0	0
LI7290-1	Circular	0	0	0	0	0	0	0	0	0
LI7290-2	Natural	0	0	0	0	0	0	0	0	0
LI7312-1	Circular	65	81	100	65	81	100	65	81	100
LI7312-2	Natural	0	0	0	0	0	0	0	0	0
LI7314-1	Circular	64	81	100	64	81	100	64	81	100
LI7314-2	Natural	0	0	0	0	0	0	0	0	0

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LI7336-1	Circular	71	94	120	71	94	120	71	94	120
LI7336-2	Natural	0	0	0	0	0	0	0	0	0
LI7400-1	Circular	71	94	120	71	94	120	71	94	120
LI7400-2	Natural	0	0	0	0	0	0	0	0	0
LI7403-1	Circular	12	19	22	12	19	22	12	19	22
LI7403-2	Natural	0	0	0	0	0	0	0	0	0
LI7420-1	Circular	5	8	-18	5	8	-18	5	8	-18
LI7420-2	Natural	0	0	0	0	0	0	0	0	0
LI7428-1	Circular	22	36	41	22	35	41	22	36	41
LI7428-2	Natural	0	0	0	0	0	0	0	0	0
LI7503-1	Circular	11	19	22	11	19	22	11	19	22
LI7503-2	Natural	0	0	0	0	0	0	0	0	0
LI7517-1	Circular	-11	-19	-22	-11	-19	-22	-11	-19	-22
LI7517-2	Natural	0	0	0	0	0	0	0	0	0
LI7528-1	Special	11	19	22	11	19	22	11	19	22
LI7528-2	Natural	0	0	0	0	0	0	0	0	0
LI7530-1	Circular	19	35	41	19	34	41	19	35	41
LI7530-2	Natural	0	0	0	0	0	0	0	0	0
LI7532-1	Circular	20	35	41	20	35	41	20	35	41
LI7532-2	Natural	0	0	0	0	0	0	0	0	0
LI7533-1	Circular	21	35	41	21	35	41	21	35	41
LI7533-2	Natural	0	0	0	0	0	0	0	0	0
LI7538-1	Circular	19	34	41	19	34	41	19	34	41
LI7538-2	Natural	0	0	0	0	0	0	0	0	0
LI7541-1	Circular	71	94	120	71	94	120	71	94	120
LI7541-2	Natural	0	0	0	0	0	0	0	0	0
LI7549-1	Circular	5	8	-18	5	8	-18	5	8	-18
LI7549-2	Natural	0	0	0	0	0	0	0	0	0
LI7553-1	Circular	0	0	-1	0	0	-1	0	0	-1
LI7553-2	Natural	7	11	-41	7	11	-43	7	11	-43
LI7615-1	Circular	72	94	120	72	94	120	73	94	120
LI7615-2	Natural	0	0	0	0	0	0	0	0	0
Link411	Circular	2	2	3	2	2	3	2	2	3
Link418	Circular	2	4	7	2	4	7	2	4	7
Link419	Circular	3	6	7	5	8	7	5	6	7
Link433	Circular	6	12	23	6	12	23	6	12	23
Link434	Circular	6	11	16	6	11	16	6	11	16
Link435	Circular	5	11	15	5	11	15	5	11	15
Link436	Circular	5	11	15	5	11	15	5	11	15
Link437	Circular	5	11	15	5	11	15	5	11	15
Link438	Circular	5	11	15	5	11	15	5	11	15
Link439	Circular	5	56	75	5	56	75	5	56	75
Link440	Circular	-25	-66	75	-44	-99	75	-41	-66	75
Link441	Circular	132	204	287	143	205	286	129	204	287
Link442	Circular	175	226	319	168	226	316	173	227	320
Link527	Natural	0	0	3	0	0	3	0	0	3
Link530	Natural	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Link537	Circular	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	14	28	#N/A
Link539	Circular	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	14	34	#N/A
link540.1	Circular	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	15	33	#N/A
link540r	Natural	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0	0	#N/A

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LJ10015-11	Circular	-9	-14	-14	-9	-14	-14	-9	-14	-14
LJ10015-12	Circular	10	18	17	10	18	18	10	18	18
LJ10015-21	Natural	0	-23	-110	0	-23	-108	0	-24	-109
LJ10015-22	Natural	2	27	-151	2	27	-155	2	27	-156
LJ10016-2	Natural	0	16	-153	0	16	-166	0	16	-165
LJ10016-3	Circular	6	10	10	6	10	10	6	10	10
LJ10017-1	Circular	-5	-4	-9	-5	-3	-9	-5	-4	-9
LJ10017-2	Natural	0	0	102	0	0	98	0	0	103
LJ10018-1	Circular	6	9	10	6	9	10	6	9	10
LJ10018-2	Natural	0	17	-140	0	17	-139	0	17	-139
LJ10019-1	Circular	-4	-3	2	-4	-3	3	-4	-3	2
LJ10019-2	Natural	0	0	-53	0	0	-55	0	0	-58
LJ10021-1	Circular	-3	-2	3	-3	-2	-2	-3	2	2
LJ10021-2	Natural	0	0	0	0	0	1	0	0	0
LJ10022-1	Circular	-4	-2	4	-4	-2	3	-4	-2	3
LJ10022-2	Natural	0	0	2	0	0	0	0	0	2
LJ10025-1	Circular	0	0	-1	0	0	2	0	0	1
LJ10025-2	Natural	0	0	0	0	0	0	0	0	0
LJ10030-1	Circular	0	0	0	0	0	0	0	0	0
LJ10030-2	Natural	0	0	0	0	0	0	0	0	0
LJ10074-1	Circular	15	23	24	15	23	24	15	23	24
LJ10074-2	Natural	0	-41	-181	0	-40	-184	0	-41	-185
LJ10106-1	Circular	15	19	19	15	19	19	15	19	19
LJ10106-2	Natural	0	-41	-156	0	-42	-151	0	-42	-147
LJ10110-1	Circular	10	11	10	10	11	10	11	10	10
LJ10110-2	Natural	-12	-44	-142	-12	-43	-140	-12	-42	-132
LJ10131-1	Circular	13	13	16	13	13	16	13	13	16
LJ10131-2	Natural	0	0	10	0	0	10	0	0	10
LJ10190-1	Circular	2	2	2	2	2	2	2	2	2
LJ10190-2	Natural	-4	-8	-14	-4	-8	-14	-4	-8	-14
LJ10191-1	Circular	113	112	114	113	112	114	113	111	114
LJ10191-2	Natural	0	9	120	0	8	120	0	8	120
LJ10210-1	Circular	2	2	2	2	2	2	2	2	2
LJ10210-2	Natural	-1	-2	-5	-1	-2	-4	-1	-2	-5
LJ10219-1	Circular	4	5	4	4	5	4	4	5	4
LJ10219-2	Natural	0	6	11	0	6	11	0	6	11
LJ10220-1	Circular	13	13	18	13	13	18	13	13	18
LJ10220-2	Natural	0	0	8	0	0	7	0	0	8
LJ10237-1	Circular	2	2	2	2	2	2	2	2	2
LJ10237-2	Natural	0	0	1	0	0	1	0	0	1
LJ10337-1	Circular	4	5	5	4	5	5	4	5	5
LJ10337-2	Natural	0	2	9	0	2	9	0	2	9
LJ10409-1	Circular	19	20	20	19	20	20	19	20	20
LJ10409-2	Natural	0	0	0	0	0	0	0	0	0
LJ10409-3	Natural	0	0	0	0	0	0	0	0	0
LJ10420-1	Circular	13	13	14	13	13	14	13	13	14
LJ10420-2	Natural	0	0	18	0	0	18	0	0	18
LJ10489-1	Circular	4	5	5	4	5	5	4	5	5
LJ10489-2	Natural	0	0	5	0	0	5	0	0	5
LJ10491-1	Circular	4	5	5	4	5	5	4	5	5
LJ10491-2	Natural	0	0	2	0	0	2	0	0	2

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LJ10492-1	Circular	-1	-2	-1	-1	-2	-1	-1	-2	-1
LJ10492-2	Natural	0	0	0	0	0	0	0	0	0
LJ10495-1	Circular	5	4	4	5	4	4	5	4	4
LJ10495-2	Natural	2	3	5	2	3	5	2	3	5
LJ10496-1	Circular	7	7	5	7	7	5	7	7	5
LJ10496-2	Natural	0	-3	32	0	-3	32	0	-3	32
LJ10496-4	Natural	-16	-43	-43	-16	-43	-43	-16	-43	-43
LJ10497-1	Circular	7	8	-5	7	8	-5	7	7	-5
LJ10497-2	Natural	0	0	31	0	0	31	0	0	31
LJ10498-1	Circular	5	4	4	5	4	4	5	4	4
LJ10498-2	Natural	2	3	6	2	3	6	2	3	6
LJ10501-1	Circular	7	7	5	7	7	5	7	7	5
LJ10501-2	Natural	0	0	32	0	0	32	0	0	32
LJ10504-1	Circular	7	8	5	7	8	5	7	8	-5
LJ10504-2	Natural	0	0	-33	0	0	-33	0	0	-33
LJ10521-1	Circular	113	114	116	113	114	116	113	114	117
LJ10521-2	Natural	0	5	102	0	5	102	0	5	102
LJ10533-1	Circular	9	11	10	9	11	10	9	11	10
LJ10533-2	Natural	0	3	12	0	3	12	0	3	12
LJ10533-3	Natural	0	2	8	0	2	8	0	2	8
LJ10584-11	Circular	42	39	35	42	40	36	42	40	36
LJ10584-12	Circular	10	10	11	10	10	11	10	10	11
LJ10584-21	Natural	0	2	-26	0	1	-26	0	1	-26
LJ10584-22	Natural	0	3	58	0	3	58	0	2	59
LJ10600-1	Circular	9	13	17	9	13	17	9	13	17
LJ10600-2	Natural	0	0	4	0	0	4	0	0	4
LJ10613-1	Circular	23	23	24	23	23	24	23	23	24
LJ10613-2	Natural	0	0	0	0	0	0	0	0	0
LJ10613-3	Natural	0	0	0	0	0	0	0	0	0
LJ10614-1	Circular	15	14	14	15	14	14	15	14	14
LJ10614-2	Natural	0	0	0	0	0	0	0	0	0
LJ10621-1	Circular	15	16	14	15	16	14	15	15	14
LJ10621-2	Natural	4	9	5	4	9	5	4	9	5
LJ10621-3	Natural	8	22	63	8	22	63	8	22	63
LJ10629-1	Circular	38	35	32	37	35	32	37	35	32
LJ10629-2	Natural	4	17	42	4	17	42	4	16	42
LJ10629-3	Natural	4	17	80	4	17	79	4	16	80
LJ10632-1	Circular	24	24	24	24	24	24	24	24	24
LJ10632-2	Natural	10	23	39	10	23	39	10	23	39
LJ10636-1	Circular	44	44	38	44	44	38	43	44	38
LJ10636-2	Natural	0	-4	-26	0	-4	-26	0	-3	-26
LJ10642-1	Circular	44	45	39	44	45	39	41	45	39
LJ10642-2	Natural	0	-12	-26	0	-12	-27	0	-12	-26
LJ10642-3	Natural	10	44	82	10	45	82	10	45	82
LJ10725-1	Circular	10	11	10	10	11	9	10	12	10
LJ10725-2	Natural	0	23	64	0	22	64	0	22	64
LJ10775-1	Circular	9	8	7	9	8	7	9	8	7
LJ10775-2	Natural	1	23	62	1	23	62	1	22	62
LJ10810-1	Circular	68	64	65	69	64	65	69	65	65
LJ10810-2	Natural	0	45	109	0	44	109	0	44	109
LJ10842-1	Circular	8	7	7	8	7	7	8	7	7

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LJ10842-2	Natural	3	22	62	3	22	62	3	22	62
LJ10967-1	Circular	7	7	7	7	7	7	7	7	7
LJ10967-2	Natural	4	23	62	4	22	62	4	22	62
LJ11079-1	Circular	7	7	7	7	7	7	7	7	7
LJ11079-2	Natural	6	25	64	6	25	64	6	24	64
LJ11109-1	Circular	66	61	63	67	61	63	67	61	63
LJ11109-2	Natural	7	51	112	8	51	112	8	51	112
LJ11159-1	Circular	27	30	30	27	30	29	27	30	29
LJ11159-2	Natural	0	20	93	0	20	92	0	20	93
LJ11160-1	Circular	15	16	16	15	16	16	15	17	16
LJ11160-2	Natural	13	37	95	12	37	95	12	37	95
LJ11163-1	Circular	19	23	17	18	24	17	18	19	17
LJ11163-2	Natural	5	34	98	5	34	98	5	33	98
LJ11170-1	Circular	32	34	33	31	33	33	31	34	33
LJ11170-2	Natural	0	30	107	0	30	106	0	30	107
LJ11176-1	Circular	32	39	39	32	39	39	32	39	39
LJ11176-2	Natural	0	6	40	0	6	40	0	6	40
LJ11176-3	Natural	0	8	53	0	8	52	0	8	53
LJ11186-1	Circular	23	24	23	23	24	23	23	24	23
LJ11186-2	Natural	10	43	113	9	43	111	9	43	113
LJ11187-1	Circular	23	25	23	23	25	23	23	25	23
LJ11187-2	Natural	0	31	94	0	31	94	0	31	94
LJ11211-1	Circular	38	44	44	38	44	44	38	44	44
LJ11211-2	Natural	0	2	24	0	2	23	0	2	24
LJ11211-3	Natural	0	2	21	0	2	21	0	2	21
LJ11213-1	Circular	37	37	36	37	37	37	37	37	37
LJ11213-2	Natural	1	11	33	2	11	33	1	11	33
LJ11220-1	Circular	36	34	31	36	34	31	36	33	31
LJ11220-2	Natural	10	19	22	10	19	22	10	19	22
LJ11226-1	Circular	12	16	11	12	16	11	12	16	11
LJ11226-2	Natural	3	19	43	4	19	43	4	19	43
LJ11227-1	Circular	27	28	28	27	28	28	27	28	28
LJ11227-2	Natural	2	31	89	3	31	89	3	30	89
LJ11228-1	Circular	11	16	11	11	16	11	11	16	11
LJ11228-2	Natural	1	15	39	2	15	39	2	15	39
LJ11230-1	Circular	13	12	11	13	12	11	13	12	11
LJ11230-2	Natural	3	19	44	4	19	44	4	19	44
LJ11315-1	Circular	8	-14	8	8	-14	8	8	-14	8
LJ11315-2	Natural	2	11	26	3	11	26	3	11	26
LJ11456-1	Circular	10	10	10	10	10	10	10	10	10
LJ11456-2	Natural	0	7	17	0	4	17	0	4	17
LJ11572-1	Circular	10	11	11	11	11	11	11	11	11
LJ11572-2	Natural	0	3	16	1	3	16	0	3	16
LJ11637-1	Circular	10	10	10	10	10	11	10	10	10
LJ11637-2	Natural	0	7	21	1	7	21	0	7	21
LJ2704-1	Circular	7	6	6	7	6	6	7	6	6
LJ2704-2	Natural	10	28	67	10	28	66	10	27	67
LJ2705-1	Circular	-25	-21	-22	-25	-21	-22	-26	-21	-22
LJ2705-2	Natural	9	42	99	10	42	99	10	41	99
LJ2722-1	Circular	30	39	26	29	33	26	29	34	26
LJ2722-2	Natural	1	30	196	1	30	196	1	30	203

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LJ2723-1	Circular	30	43	26	30	43	26	30	43	26
LJ2723-2	Natural	0	28	239	0	28	239	0	28	241
LJ2739-1	Circular	31	55	63	31	55	63	31	55	64
LJ2739-2	Natural	0	0	41	0	0	41	0	0	42
LJ2740-1	Circular	0	-6	10	0	-5	10	0	-7	10
LJ2740-2	Natural	0	0	0	0	0	0	0	0	0
LJ2741-1	Circular	1	-9	10	1	-10	10	1	-7	10
LJ2741-2	Natural	0	0	0	0	0	0	0	0	0
LJ2777-1	Circular	248	272	290	249	272	290	249	272	290
LJ2777-2	Natural	0	0	0	0	0	0	0	0	0
LJ2790-1	Circular	44	67	61	44	67	61	44	68	61
LJ2790-2	Natural	0	0	0	0	0	0	0	0	0
LJ2791-1	Circular	45	65	61	45	65	61	45	65	61
LJ2791-2	Natural	0	0	0	0	0	0	0	0	0
LJ2792-1	Circular	45	62	62	45	63	63	45	63	62
LJ2792-2	Natural	0	0	-44	0	0	-42	0	0	-43
LJ2793-1	Circular	55	73	78	55	72	78	55	72	78
LJ2793-2	Natural	0	0	0	0	0	0	0	0	0
LJ2794-1	Circular	54	73	78	54	72	78	54	72	77
LJ2794-2	Natural	0	0	0	0	0	0	0	0	0
LJ2795-1	Circular	110	125	103	110	126	103	110	126	103
LJ2795-2	Natural	0	0	0	0	0	0	0	0	0
LJ2798-1	Circular	45	60	63	45	61	62	45	61	63
LJ2798-2	Natural	0	0	0	0	0	0	0	0	0
LJ2799-1	Circular	54	72	87	63	71	87	69	71	87
LJ2799-2	Natural	0	0	0	0	0	0	0	0	0
LJ2800-1	Special	72	116	175	79	115	175	81	115	175
LJ2800-2	Natural	0	0	0	0	0	0	0	0	0
LJ2801-1	Special	160	-189	-193	163	-189	-194	162	-189	-193
LJ2801-2	Natural	0	0	0	0	0	0	0	0	0
LJ2802-1	Circular	160	-189	-195	164	-189	-195	162	-189	-195
LJ2802-2	Natural	0	0	0	0	0	0	0	0	0
LJ2803-1	Circular	160	-189	-193	163	-189	-193	162	-189	-194
LJ2803-2	Natural	0	0	0	0	0	0	0	0	0
LJ2804-1	Circular	183	244	268	185	244	266	184	243	265
LJ2804-2	Natural	0	0	0	0	0	0	0	0	0
LJ2805-1	Circular	238	267	288	239	267	288	239	284	287
LJ2805-2	Natural	0	0	0	0	0	0	0	0	0
LJ2806-1	Circular	61	80	-66	61	80	-65	61	81	-65
LJ2806-2	Natural	0	0	0	0	0	0	0	0	0
LJ3251-1	Circular	15	17	19	15	17	19	15	17	19
LJ3251-2	Natural	0	0	0	0	0	0	0	0	0
LJ4567-1	Circular	3	3	3	3	3	3	3	3	3
LJ4567-2	Natural	0	0	0	0	0	0	0	0	0
LJ4596-1	Circular	5	5	5	5	5	5	5	5	5
LJ4596-2	Natural	1	4	11	1	4	11	0	4	11
LJ4597-1	Circular	5	7	7	5	7	7	5	7	7
LJ4597-2	Natural	0	0	8	0	0	8	0	0	8
LJ4663-1	Circular	5	5	5	5	5	5	5	5	5
LJ4663-2	Natural	0	4	11	0	4	11	0	4	11
LJ4734-1	Circular	15	16	16	15	16	16	15	16	16

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LJ4734-2	Natural	3	18	41	3	17	41	3	17	41
LJ4745-1	Circular	3	3	3	3	3	3	3	3	3
LJ4745-2	Natural	0	0	0	0	0	0	0	0	0
LJ4764-1	Circular	15	15	15	15	15	15	15	15	15
LJ4764-2	Natural	3	16	40	3	15	39	2	15	40
LJ4859-1	Circular	15	17	19	15	17	19	15	17	19
LJ4859-2	Natural	0	0	0	0	0	0	0	0	0
LJ4891-1	Circular	18	21	22	18	21	22	18	21	22
LJ4891-2	Natural	0	0	0	0	0	0	0	0	0
LJ4937-1	Circular	22	23	24	22	23	24	22	23	24
LJ4937-2	Natural	12	34	75	12	34	74	12	34	74
LJ4977-1	Circular	3	5	5	3	5	5	3	5	5
LJ4977-2	Natural	0	0	5	0	0	5	0	0	5
LJ5004-1	Circular	3	5	5	3	5	5	3	5	5
LJ5004-2	Natural	0	0	3	0	0	3	0	0	3
LJ5085-1	Circular	18	21	22	18	21	22	18	21	22
LJ5085-2	Natural	0	0	0	0	0	0	0	0	0
LJ5104-1	Circular	6	6	6	6	6	6	6	6	6
LJ5104-2	Natural	0	3	8	0	3	8	0	3	8
LJ5168-1	Circular	6	7	7	6	7	7	6	7	7
LJ5168-2	Natural	0	0	4	0	0	4	0	0	4
LJ5205-1	Circular	6	7	10	6	7	10	6	7	10
LJ5205-2	Natural	0	0	0	0	0	0	0	0	0
LJ5207-1	Circular	0	0	0	0	0	0	0	0	0
LJ5207-2	Natural	0	0	0	0	0	0	0	0	0
LJ5209-1	Circular	0	0	0	0	0	0	0	0	0
LJ5209-2	Natural	0	0	0	0	0	0	0	0	0
LJ5212-1	Circular	0	0	0	0	0	0	0	0	0
LJ5212-2	Natural	0	0	0	0	0	0	0	0	0
LJ5228-1	Circular	5	6	4	5	6	4	5	6	4
LJ5228-2	Natural	5	11	20	5	11	20	5	11	20
LJ5236-1	Circular	38	38	38	39	38	38	39	38	38
LJ5236-2	Natural	29	68	134	28	67	134	28	67	134
LJ5259-1	Circular	39	39	38	39	39	38	39	39	38
LJ5259-2	Natural	34	77	143	34	76	143	34	76	143
LJ5271-1	Circular	5	4	3	5	4	3	5	4	3
LJ5271-2	Natural	3	5	9	3	5	9	3	5	9
LJ5285-1	Special	32	33	33	32	33	33	32	33	33
LJ5285-2	Natural	0	13	31	0	13	31	0	13	31
LJ5293-1	Circular	13	12	12	13	12	12	13	12	12
LJ5293-2	Natural	11	22	38	11	22	38	11	21	38
LJ5323-1	Circular	4	5	5	4	5	5	4	5	5
LJ5323-2	Natural	0	3	8	0	3	8	0	3	8
LJ5325-1	Circular	39	39	38	39	39	38	39	39	38
LJ5325-2	Natural	35	82	150	35	82	149	35	82	150
LJ5363-1	Circular	12	12	12	12	12	12	12	12	12
LJ5363-2	Natural	6	16	32	6	16	32	6	16	32
LJ5411-1	Circular	29	29	29	29	29	29	29	29	29
LJ5411-2	Natural	3	17	34	3	17	34	3	17	34
LJ5415-1	Circular	39	39	38	39	39	38	39	39	38
LJ5415-2	Natural	7	59	133	7	58	133	7	58	133

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LJ5461-1	Circular	-2	4	3	-2	3	3	-2	4	4
LJ5461-2	Natural	0	-4	-146	0	-4	-151	0	-5	-151
LJ5475-1	Circular	0	0	0	0	0	0	0	0	0
LJ5475-2	Natural	0	0	0	0	0	0	0	0	0
LJ5507-1	Circular	0	0	0	0	0	0	0	0	0
LJ5507-2	Natural	0	0	0	0	0	0	0	0	0
LJ5516-1	Circular	45	46	42	44	46	42	44	46	42
LJ5516-2	Natural	0	108	208	0	108	210	0	111	213
LJ5517-1	Circular	0	0	0	0	0	0	0	0	0
LJ5517-2	Natural	0	0	0	0	0	0	0	0	0
LJ5537-1	Circular	9	12	9	9	12	9	9	12	9
LJ5537-2	Natural	3	13	26	3	13	26	3	13	26
LJ5540-1	Circular	10	10	10	10	10	10	10	10	10
LJ5540-2	Natural	0	9	22	0	9	22	0	9	22
LJ5580-1	Circular	42	45	47	42	45	47	42	45	47
LJ5580-2	Natural	0	0	0	0	0	0	0	0	0
LJ5628-1	Circular	8	8	8	8	8	8	8	8	8
LJ5628-2	Natural	2	11	24	2	11	24	2	11	24
LJ5648-1	Special	21	20	19	21	20	19	21	20	19
LJ5648-2	Natural	3	10	20	3	10	20	3	10	20
LJ5648-3	Natural	5	17	35	5	17	35	5	17	35
LJ5683-1	Circular	6	12	19	6	12	19	6	12	19
LJ5683-2	Natural	0	0	0	0	0	0	0	0	0
LJ5696-1	Circular	21	20	19	21	20	19	21	20	19
LJ5696-2	Natural	1	9	22	1	9	22	1	9	22
LJ5702-1	Circular	42	45	47	42	45	47	42	45	47
LJ5702-2	Natural	0	0	0	0	0	0	0	0	0
LJ5707-1	Circular	25	25	24	25	25	24	25	25	24
LJ5707-2	Natural	7	23	40	7	23	40	7	23	40
LJ5752-1	Circular	36	36	36	36	36	36	36	36	36
LJ5752-2	Natural	14	58	101	14	58	101	14	58	101
LJ5758-1	Circular	-7	-10	-7	-6	-10	-7	-6	-10	-7
LJ5758-2	Natural	0	0	0	0	0	0	0	0	0
LJ5775-1	Circular	0	-2	-3	0	-2	3	0	-2	-3
LJ5775-2	Natural	0	0	0	0	0	0	0	0	0
LJ5826-1	Circular	-13	-23	-10	-14	-22	-10	-13	-23	-10
LJ5826-2	Natural	0	0	0	0	0	0	0	0	0
LJ5860-1	Circular	6	17	20	6	13	24	6	20	22
LJ5860-2	Natural	0	5	10	0	5	11	0	5	10
LJ5891-1	Circular	0	-6	-7	0	-6	-7	0	-6	-7
LJ5891-2	Natural	0	0	0	0	0	1	0	0	0
LJ5905-1	Circular	42	45	47	42	45	47	42	45	47
LJ5905-2	Natural	0	0	0	0	0	0	0	0	0
LJ5926-1	Circular	28	37	36	28	37	36	28	37	36
LJ5926-2	Natural	0	0	0	0	0	0	0	0	0
LJ5935-1	Circular	46	58	51	46	59	51	46	59	51
LJ5935-2	Natural	0	28	71	0	28	71	0	28	71
LJ5965-1	Circular	64	68	71	63	68	71	63	68	71
LJ5965-2	Natural	0	0	0	0	0	0	0	0	0
LJ5997-1	Circular	11	18	19	11	18	19	11	18	19
LJ5997-2	Natural	0	0	-16	0	0	-16	0	0	-16

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LJ6011-1	Special	22	35	38	22	35	38	22	35	38
LJ6011-2	Natural	0	0	18	0	0	20	0	0	19
LJ6025-1	Circular	7	21	26	7	19	27	7	22	25
LJ6025-2	Natural	0	7	18	0	7	-19	0	7	-18
LJ6068-1	Circular	0	3	3	0	3	3	0	3	3
LJ6068-2	Natural	0	0	-3	0	0	-3	0	0	-3
LJ6075-1	Circular	11	16	20	11	16	20	11	16	20
LJ6075-2	Natural	0	0	4	0	0	4	0	0	4
LJ6079-1	Circular	22	31	36	22	31	36	22	31	36
LJ6079-2	Natural	0	0	-7	0	0	-8	0	0	-6
LJ6120-1	Circular	22	32	32	22	32	32	22	32	32
LJ6120-2	Natural	0	4	25	0	4	26	0	4	25
LJ6131-1	Circular	73	77	75	73	77	75	73	77	75
LJ6131-2	Natural	0	11	55	0	11	54	0	11	55
LJ6143-1	Circular	11	16	20	11	16	20	11	16	20
LJ6143-2	Natural	0	0	4	0	0	4	0	0	4
LJ6164-1	Circular	11	15	16	11	15	16	11	15	16
LJ6164-2	Natural	0	1	19	0	1	19	0	1	19
LJ6211-1	Circular	22	31	36	22	31	36	22	31	36
LJ6211-2	Natural	0	0	0	0	0	0	0	0	0
LJ6231-1	Circular	0	0	0	0	0	0	0	0	0
LJ6231-2	Natural	0	0	0	0	0	0	0	0	0
LJ6233-1	Circular	22	30	30	22	30	30	22	30	30
LJ6233-2	Natural	0	20	42	0	20	43	0	21	42
LJ6237-1	Circular	1	34	-21	5	-19	-22	2	16	-21
LJ6237-2	Natural	0	0	0	0	0	0	0	0	0
LJ6291-1	Circular	0	0	0	0	0	0	0	0	0
LJ6291-2	Natural	0	0	0	0	0	0	0	0	0
LJ6320-1	Circular	160	-189	-195	164	-189	-195	162	-189	-195
LJ6320-2	Natural	0	0	0	0	0	0	0	0	0
LJ6366-1	Circular	0	0	0	0	0	0	0	0	0
LJ6366-2	Natural	0	0	0	0	0	0	0	0	0
LJ6392-1	Circular	22	35	32	22	35	32	22	34	32
LJ6392-2	Natural	0	10	37	0	10	37	0	10	36
LJ6408-1	Circular	0	0	0	0	0	0	0	0	0
LJ6408-2	Natural	0	0	0	0	0	0	0	0	0
LJ6450-1	Circular	54	71	87	54	71	87	54	71	86
LJ6450-2	Natural	0	0	0	0	0	0	0	0	0
LJ6463-1	Circular	55	71	85	55	71	84	55	71	84
LJ6463-2	Natural	0	17	-78	0	17	-78	0	17	-74
LJ6467-1	Circular	156	181	164	156	181	165	156	181	164
LJ6467-2	Natural	0	48	149	0	47	149	0	48	149
LJ6468-1	Circular	49	57	64	49	58	64	49	59	64
LJ6468-2	Natural	0	-58	-73	0	-58	-73	0	-58	-74
LJ6469-1	Circular	180	244	267	183	243	266	182	243	265
LJ6469-2	Natural	0	0	0	0	0	0	0	0	0
LJ6471-1	Circular	84	105	91	84	105	91	84	105	91
LJ6471-2	Natural	0	46	97	0	45	97	0	46	97
LJ6477-1	Circular	74	80	77	74	80	78	74	80	77
LJ6477-2	Natural	0	55	87	0	55	87	0	55	87
LJ6483-1	Circular	64	87	107	64	87	107	64	87	107

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LJ6483-2	Natural	0	0	0	0	0	0	0	0	0
LJ6495-1	Circular	40	54	67	40	54	67	40	54	67
LJ6495-2	Natural	0	0	29	0	0	29	0	0	27
LJ6501-1	Circular	39	53	52	39	53	52	39	53	52
LJ6501-2	Natural	0	1	57	0	1	57	0	1	56
LJ6507-1	Circular	6	11	10	6	10	10	6	11	10
LJ6507-2	Natural	0	4	12	0	4	13	0	4	12
LJ6517-1	Circular	47	47	45	47	47	45	47	47	45
LJ6517-2	Natural	30	68	66	30	65	66	30	69	67
LJ6518-1	Circular	0	0	0	0	0	0	0	0	0
LJ6518-2	Natural	0	0	0	0	0	0	0	0	0
LJ6521-1	Circular	0	0	0	0	0	0	0	0	0
LJ6521-2	Natural	0	0	0	0	0	0	0	0	0
LJ6677-1	Circular	196	249	270	197	248	270	197	248	269
LJ6677-2	Natural	0	0	0	0	0	0	0	0	0
LJ6698-1	Circular	33	33	33	33	33	33	33	33	33
LJ6698-2	Natural	9	41	91	9	41	91	9	41	91
LJ6705-1	Circular	0	0	0	0	0	0	0	0	0
LJ6705-2	Natural	0	0	0	0	0	0	0	0	0
LJ6721-1	Circular	244	271	290	245	271	290	245	277	290
LJ6721-2	Natural	0	0	0	0	0	0	0	0	0
LJ6762-1	Circular	32	31	31	32	31	31	32	31	31
LJ6762-2	Natural	18	49	97	18	49	97	18	49	97
LJ6769-1	Circular	252	273	290	253	273	290	252	273	292
LJ6769-2	Natural	0	0	0	0	0	0	0	0	0
LJ6806-1	Circular	11	18	31	11	18	31	11	18	31
LJ6806-2	Natural	0	0	0	0	0	0	0	0	0
LJ6810-1	Circular	5	8	14	5	8	14	5	8	14
LJ6810-2	Natural	0	0	0	0	0	0	0	0	0
LJ6811-1	Circular	5	8	13	5	8	13	5	8	13
LJ6811-2	Natural	0	0	0	0	0	0	0	0	0
LJ6822-1	Circular	156	181	164	156	178	164	156	182	164
LJ6822-2	Natural	0	73	207	0	72	207	0	73	206
LJ6822-4	Natural	0	0	-43	0	0	-43	0	0	-43
LJ6851-1	Circular	45	74	84	45	73	84	45	73	84
LJ6851-2	Natural	0	0	1	0	0	1	0	0	1
LJ6871-1	Circular	30	61	78	30	61	78	30	61	78
LJ6871-2	Natural	0	0	0	0	0	0	0	0	0
LJ6876-1	Circular	31	61	70	31	61	70	31	61	70
LJ6876-2	Natural	0	0	77	0	0	77	0	0	77
LJ6883-1	Circular	21	38	48	21	38	48	21	38	48
LJ6883-2	Natural	0	0	47	0	0	46	0	0	47
LJ6892-1	Circular	21	39	55	21	39	55	21	39	55
LJ6892-2	Natural	0	0	19	0	0	19	0	0	19
LJ6904-1	Circular	11	18	31	11	18	31	11	18	31
LJ6904-2	Natural	0	0	0	0	0	0	0	0	0
LJ6963-1	Circular	5	8	15	5	8	15	5	8	15
LJ6963-2	Natural	0	0	0	0	0	0	0	0	0
LJ6997-1	Circular	30	61	78	30	61	78	30	61	78
LJ6997-2	Natural	0	0	0	0	0	0	0	0	0
LJ6999-1	Circular	32	32	32	32	32	32	32	32	32

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LJ6999-2	Natural	10	41	89	10	41	89	10	41	89
LJ7000-1	Circular	8	8	8	8	8	8	8	8	8
LJ7000-2	Natural	1	10	22	1	10	22	1	10	22
LJ7009-1	Circular	0	0	0	0	0	0	0	0	0
LJ7009-2	Natural	0	0	0	0	0	0	0	0	0
LJ7010-1	Circular	518	572	658	511	573	650	517	574	653
LJ7010-2	Natural	0	54	189	0	53	189	0	53	188
LJ7019(2)	Circular	0	0	0	0	0	0	0	0	0
LJ7019-11	Circular	326	331	362	325	335	362	326	362	362
LJ7019-21	Natural	0	219	356	0	218	358	0	219	357
LJ7021-1	Circular	46	72	91	46	73	91	46	73	91
LJ7021-2	Natural	0	0	0	0	0	0	0	0	0
LJ7027-1	Circular	320	387	437	321	387	437	320	387	437
LJ7027-2	Natural	0	0	0	0	0	0	0	0	0
LJ7028-1	Circular	505	577	653	506	578	653	506	579	656
LJ7028-2	Natural	0	28	182	0	27	183	0	28	181
LJ7032-1	Circular	12	15	14	12	15	14	12	15	14
LJ7032-2	Natural	0	13	32	0	13	32	0	13	32
LJ7038-1	Circular	38	38	38	38	38	38	38	38	38
LJ7038-2	Natural	4	35	84	4	35	84	4	35	84
LJ7051-1	Circular	296	315	316	296	314	316	296	315	316
LJ7051-2	Natural	0	0	16	0	0	15	0	0	16
LJ7053-1	Circular	13	16	15	13	16	15	13	16	15
LJ7053-2	Natural	0	11	30	0	11	30	0	11	30
LJ7062-1	Circular	296	316	317	296	315	317	296	315	317
LJ7062-2	Natural	0	0	49	0	0	48	0	0	48
LJ7067-1	Circular	18	22	21	18	22	21	18	22	21
LJ7067-2	Natural	0	15	41	0	15	41	0	15	41
LJ7070-1	Circular	35	36	35	35	36	35	35	36	35
LJ7070-2	Natural	9	39	88	9	39	88	9	39	88
LJ7073-1	Circular	523	587	659	520	588	659	522	589	661
LJ7073-2	Natural	0	36	237	0	35	230	0	36	228
LJ7084-1	Circular	46	73	91	46	73	91	46	73	91
LJ7084-2	Natural	0	0	0	0	0	0	0	0	0
LJ7092-1	Circular	640	682	747	637	683	749	637	686	750
LJ7092-2	Natural	0	0	0	0	0	0	0	0	0
LJ7108-1	Circular	46	73	107	46	73	107	46	73	108
LJ7108-2	Natural	0	0	0	0	0	0	0	0	0
LJ7134-1	Circular	0	0	1	0	0	1	0	1	1
LJ7134-2	Natural	0	0	0	0	0	0	0	0	0
LJ7153-1	Circular	296	316	325	296	316	325	296	316	325
LJ7153-2	Natural	0	0	0	0	0	0	0	0	0
LJ7175-1	Circular	5	8	9	5	8	9	5	8	9
LJ7175-2	Natural	0	0	7	0	0	7	0	0	7
LJ7180-1	Circular	23	27	32	23	27	32	23	27	32
LJ7180-2	Natural	0	0	0	0	0	0	0	0	0
LJ7242-1	Circular	23	27	32	23	27	32	23	27	32
LJ7242-2	Natural	0	0	0	0	0	0	0	0	0
LJ7277-1	Circular	23	27	29	23	27	30	23	27	29
LJ7277-2	Natural	0	0	17	0	0	17	0	0	17
LJ7292-1	Circular	23	27	29	23	27	29	23	27	29

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LJ7292-2	Natural	0	0	26	0	0	26	0	0	26
LJ7301-1	Circular	296	342	320	296	345	320	296	345	320
LJ7301-2	Natural	0	0	60	0	0	60	0	0	60
LJ7325-1	Circular	297	327	330	297	328	330	297	327	330
LJ7325-2	Natural	0	0	0	0	0	0	0	0	0
LJ7361-1	Circular	9	9	9	9	9	9	9	9	9
LJ7361-2	Natural	0	1	3	0	1	3	0	1	3
LJ7361-3	Natural	2	9	22	2	9	22	2	9	22
LJ7363-1	Circular	298	339	324	297	334	324	297	335	325
LJ7363-2	Natural	0	0	52	0	0	51	0	0	52
LJ7366-1	Circular	46	73	87	46	73	86	46	73	87
LJ7366-2	Natural	0	0	37	0	0	37	0	0	38
LJ7368-1	Circular	23	24	24	23	24	24	23	24	24
LJ7368-2	Natural	0	8	35	0	8	35	0	8	35
LJ7372-1	Circular	10	10	11	10	10	11	10	10	11
LJ7372-2	Natural	0	0	0	0	0	0	0	0	0
LJ7377-1	Circular	21	21	21	21	21	21	21	21	21
LJ7377-2	Natural	3	13	26	3	13	26	3	13	26
LJ7377-3	Natural	2	10	22	2	10	22	2	10	22
LJ7391-1	Circular	298	355	333	299	357	333	298	355	333
LJ7391-2	Natural	0	0	0	0	0	0	0	0	0
LJ7411-1	Circular	3	4	5	3	4	5	3	4	5
LJ7411-2	Natural	0	1	7	0	1	7	0	1	7
LJ7416-1	Circular	3	5	5	3	5	5	3	5	5
LJ7416-2	Natural	0	0	3	0	0	3	0	0	3
LJ7425-1	Circular	7	16	19	7	16	19	7	15	19
LJ7425-2	Natural	0	0	-13	0	0	-14	0	0	-14
LJ7445-1	Circular	6	7	6	6	7	6	6	7	6
LJ7445-2	Natural	0	6	14	0	6	13	0	6	14
LJ7464-1	Circular	7	16	24	7	16	24	7	16	24
LJ7464-2	Natural	0	0	0	0	0	0	0	0	0
LJ7543-1	Circular	5	7	7	5	7	7	5	7	7
LJ7543-2	Natural	0	2	9	0	2	9	0	2	9
LJ7565-1	Circular	7	16	24	7	16	24	7	16	24
LJ7565-2	Natural	0	0	0	0	0	0	0	0	0
LJ7566-1	Circular	6	8	8	6	8	8	6	8	8
LJ7566-2	Natural	0	3	11	0	3	11	0	3	11
LJ7570-1	Circular	7	16	25	7	16	25	7	16	25
LJ7570-2	Natural	0	0	0	0	0	0	0	0	0
LJ7576-1	Circular	46	73	76	46	73	76	46	73	76
LJ7576-2	Natural	0	0	49	0	0	49	0	0	49
LJ7600-1	Special	286	324	305	286	322	304	285	320	305
LJ7600-2	Natural	0	0	0	0	0	0	0	0	0
LJ7609-1	Special	294	333	308	296	329	305	290	328	308
LJ7609-2	Natural	0	0	0	0	0	0	0	0	0
LJ7611-1	Circular	6	7	8	6	7	8	6	7	8
LJ7611-2	Natural	0	6	12	0	6	12	0	6	12
LJ7643-1	Circular	6	11	18	6	11	18	6	11	18
LJ7643-2	Natural	0	0	0	0	0	0	0	0	0
LJ7663-1	Special	287	321	299	286	320	298	288	318	299
LJ7663-2	Natural	0	0	0	0	0	0	0	0	0

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LJ7737-1	Circular	21	40	42	21	40	42	21	40	42
LJ7737-2	Natural	0	0	37	0	0	37	0	0	37
LJ7739-1	Circular	0	0	0	0	0	0	0	0	0
LJ7739-2	Natural	0	0	0	0	0	0	0	0	0
LJ7774-1	Circular	21	36	36	21	36	36	21	36	36
LJ7774-2	Natural	0	9	41	0	9	41	0	9	41
LJ7776-1	Circular	4	9	16	4	9	16	4	9	16
LJ7776-2	Natural	0	0	0	0	0	0	0	0	0
LJ7778-1	Circular	21	40	40	21	40	40	21	40	40
LJ7778-2	Natural	0	1	40	0	1	40	0	1	40
LJ7781-1	Circular	11	21	38	11	21	38	11	21	38
LJ7781-2	Natural	0	0	0	0	0	0	0	0	0
LJ7907-1	Circular	5	9	10	5	9	10	5	9	10
LJ7907-2	Natural	0	0	9	0	0	9	0	0	9
LJ7973-1	Circular	5	8	8	5	8	8	5	8	8
LJ7973-2	Natural	0	1	12	0	1	12	0	1	12
LJ7977-1	Circular	0	0	0	0	0	0	0	0	0
LJ7977-2	Natural	0	0	0	0	0	0	0	0	0
LJ7993-1	Circular	5	7	7	5	7	7	5	7	7
LJ7993-2	Natural	0	4	12	0	4	12	0	4	12
LJ8043-1	Special	-269	-319	-289	-268	-319	-289	-268	-319	-288
LJ8043-2	Natural	0	0	0	0	0	0	0	0	0
LJ8061-1	Circular	0	0	0	0	0	0	0	0	0
LJ8061-2	Natural	0	0	0	0	0	0	0	0	0
LJ8063-1	Circular	5	6	6	5	6	6	5	6	6
LJ8063-2	Natural	0	4	12	0	4	12	0	4	12
LJ8085-1	Circular	6	7	6	6	7	6	6	7	6
LJ8085-2	Natural	0	8	15	0	8	15	0	8	15
LJ8108-1	Circular	4	5	5	4	5	5	4	5	5
LJ8108-2	Natural	0	3	10	0	3	10	0	3	10
LJ8136-1	Circular	5	6	6	5	6	6	5	6	6
LJ8136-2	Natural	0	4	11	0	4	11	0	4	11
LJ8350-1	Special	273	320	289	273	320	289	273	321	289
LJ8350-2	Natural	0	0	0	0	0	0	0	0	0
LJ8427-1	Special	268	330	390	270	330	390	269	330	390
LJ8427-2	Natural	0	0	0	0	0	0	0	0	0
LJ8442-1	Special	273	330	390	273	330	390	273	330	390
LJ8442-2	Natural	0	0	0	0	0	0	0	0	0
LJ8469-1	Circular	205	232	252	205	232	252	205	232	252
LJ8469-2	Natural	0	0	0	0	0	0	0	0	0
LJ8475-1	Circular	3	5	8	3	5	8	3	5	8
LJ8475-2	Natural	0	0	0	0	0	0	0	0	0
LJ8539-1	Circular	34	39	43	34	39	43	34	39	43
LJ8539-2	Natural	0	0	0	0	0	0	0	0	0
LJ8557-1	Circular	3	5	8	3	5	8	3	5	8
LJ8557-2	Natural	0	0	0	0	0	0	0	0	0
LJ8558-1	Circular	6	12	19	6	12	19	6	12	19
LJ8558-2	Natural	0	0	0	0	0	0	0	0	0
LJ8561-1	Circular	6	12	19	6	12	19	6	12	19
LJ8561-2	Natural	0	0	0	0	0	0	0	0	0
LJ8596-1	Circular	6	12	19	6	12	19	6	12	19

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LJ8625-1	Circular	205	232	252	205	232	252	205	232	252
LJ8625-2	Natural	0	0	0	0	0	0	0	0	0
LJ8626-11	Circular	12	-18	-24	12	-18	-24	12	-18	-24
LJ8626-12	Circular	34	39	43	34	39	43	34	39	43
LJ8626-21	Natural	0	0	0	0	0	0	0	0	0
LJ8626-22	Natural	0	0	0	0	0	0	0	0	0
LJ8810-1	Circular	34	45	53	34	45	53	34	45	53
LJ8810-2	Natural	0	0	0	0	0	0	0	0	0
LJ8838-1	Circular	7	7	7	7	7	7	7	7	7
LJ8838-2	Natural	4	11	21	4	11	21	4	11	21
LJ8846-1	Circular	8	8	8	8	8	8	8	8	8
LJ8846-2	Natural	6	17	32	6	17	32	6	17	32
LJ8847-1	Circular	9	9	9	9	9	9	9	9	9
LJ8847-2	Natural	8	21	39	8	21	39	8	21	39
LJ8863-1	Circular	34	45	53	34	45	53	34	45	53
LJ8863-2	Natural	0	0	0	0	0	0	0	0	0
LJ8877-1	Circular	12	12	12	12	12	12	12	12	12
LJ8877-2	Natural	9	25	49	9	25	49	9	25	49
LJ8901-1	Circular	7	8	-34	7	8	-34	7	8	-34
LJ8901-2	Natural	0	0	0	0	0	0	0	0	0
LJ9041-1	Circular	199	212	260	199	212	261	199	212	260
LJ9041-2	Natural	0	0	0	0	0	0	0	0	0
LJ9055-1	Circular	7	8	-28	7	8	-28	7	8	-28
LJ9055-2	Natural	0	0	7	0	0	7	0	0	7
LJ9157-11	Circular	8	9	10	8	9	10	8	9	10
LJ9157-12	Circular	7	8	9	7	8	9	7	8	9
LJ9157-21	Natural	0	0	0	0	0	0	0	0	0
LJ9157-22	Natural	0	0	-8	0	0	-8	0	0	-8
LJ9162-1	Circular	8	8	8	8	8	8	8	8	8
LJ9162-2	Natural	1	6	13	1	6	13	1	6	13
LJ9162-3	Natural	1	5	11	1	5	11	1	5	11
LJ9167-1	Circular	8	10	9	8	10	9	8	10	9
LJ9167-2	Natural	0	3	10	0	3	10	0	3	10
LJ9174-1	Circular	3	5	7	3	5	7	3	5	7
LJ9174-2	Natural	0	0	2	0	0	2	0	0	2
LJ9179-1	Circular	3	5	7	3	5	7	3	5	7
LJ9179-2	Natural	0	0	1	0	0	1	0	0	1
LJ9184-1	Circular	6	8	7	6	8	7	6	8	8
LJ9184-2	Natural	0	6	14	0	6	14	0	6	14
LJ9185-1	Circular	7	8	7	7	8	7	7	8	7
LJ9185-2	Natural	0	5	12	0	5	12	0	5	12
LJ9188-1	Circular	5	6	6	5	6	6	5	6	6
LJ9188-2	Natural	0	3	8	0	3	8	0	3	8
LJ9189-1	Circular	6	11	11	6	11	11	6	11	11
LJ9189-2	Natural	0	1	9	0	1	9	0	1	9
LJ9190-1	Circular	5	8	8	5	8	8	5	8	8
LJ9190-2	Natural	0	0	6	0	0	6	0	0	6
LJ9245-1	Circular	10	13	15	10	13	15	10	13	15
LJ9245-2	Natural	0	0	-7	0	0	-7	0	0	-7
LJ9373-1	Circular	10	13	15	10	13	15	10	13	15
LJ9373-2	Natural	0	0	3	0	0	3	0	0	3

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LJ9419-1	Circular	-178	-200	-251	-178	-200	-250	-178	-200	-250
LJ9419-2	Natural	0	0	0	0	0	0	0	0	0
LJ9461-1	Circular	5	4	4	5	4	4	5	4	4
LJ9461-2	Natural	4	9	17	3	9	17	3	9	17
LJ9537-1	Circular	10	13	15	10	13	15	10	13	15
LJ9537-2	Natural	0	0	-18	0	0	-13	0	0	-12
LJ9794-1	Circular	10	13	14	10	13	14	10	13	14
LJ9794-2	Natural	0	0	-83	0	0	-70	0	0	-70
LJ9797-1	Circular	-182	-200	-214	-182	-200	-214	-182	-200	-214
LJ9797-2	Natural	0	0	-220	0	0	-220	0	0	-218
LJ9802-1	Circular	14	24	24	14	24	24	14	24	24
LJ9802-2	Natural	0	1	23	0	1	23	0	1	23
LJ9807-1	Circular	10	13	14	10	13	14	10	13	14
LJ9807-2	Natural	2	14	36	2	14	36	2	14	36
LJ9809-1	Circular	5	4	3	4	4	-3	4	6	-3
LJ9809-2	Natural	1	3	10	0	3	10	0	3	10
LJ9810-1	Circular	13	12	13	13	12	13	13	12	13
LJ9810-2	Natural	2	20	42	2	20	42	2	20	43
LJ9811-1	Circular	8	9	8	8	9	8	8	9	8
LJ9811-2	Natural	5	13	29	5	13	29	4	13	29
LJ9817-1	Circular	3	11	22	3	11	22	3	11	22
LJ9817-2	Natural	0	0	0	0	0	0	0	0	0
LJ9817-3	Natural	20	38	57	19	38	57	19	38	57
LJ9874-11	Circular	37	56	-47	36	56	-47	36	57	-47
LJ9874-12	Circular	10	13	13	10	12	12	10	13	12
LJ9874-21	Natural	0	48	694	0	48	690	0	47	685
LJ9874-22	Natural	0	8	260	0	8	257	0	8	229
LJ9885-1	Circular	3	5	5	3	5	5	3	5	5
LJ9885-2	Natural	0	0	3	0	0	3	0	0	3
LJ9907-1	Circular	3	3	3	3	3	3	3	3	3
LJ9907-2	Natural	0	2	5	0	2	5	0	2	5
LJ9915-1	Circular	4	4	3	3	3	3	3	3	3
LJ9915-2	Natural	1	2	4	0	2	4	0	2	4
LJ9920-1	Circular	5	6	5	5	6	5	5	6	5
LJ9920-2	Natural	0	4	9	0	4	9	0	4	9
LJ9922-1	Circular	17	19	19	17	19	19	17	19	19
LJ9922-2	Natural	0	13	35	0	13	35	0	13	35
LJ9923-1	Circular	17	20	19	17	20	19	17	20	19
LJ9923-2	Natural	0	11	34	0	11	34	0	11	34
LJ9924-1	Circular	17	27	26	17	27	26	17	27	26
LJ9924-2	Natural	0	4	28	0	4	28	0	4	28
LJ9942-1	Circular	25	27	28	25	27	28	25	27	28
LJ9942-2	Natural	1	34	108	1	34	107	1	34	108
LJ9949-1	Circular	26	33	33	26	33	33	26	33	33
LJ9949-2	Natural	0	28	107	0	28	107	0	28	107
LJ9952-1	Circular	27	33	34	27	33	34	27	33	34
LJ9952-2	Natural	0	30	107	0	30	107	0	30	107
LJ9986-1	Circular	17	26	19	17	26	19	17	26	19
LJ9986-2	Natural	0	21	221	0	21	224	0	21	227
LJDOT1-2	Rectangula	0	152	283	0	152	283	0	152	283
LJDOT4-3	Natural	0	102	203	0	102	202	0	102	202

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LJUNCT	Circular	2463	2680	2740	2474	2676	2738	2476	2674	2732
LL14613-1	Circular	4	3	3	4	3	3	4	3	3
LL14613-2	Natural	2	7	12	2	7	12	2	7	12
LL14670-1	Circular	2	2	2	2	2	2	2	2	2
LL14670-2	Natural	0	-3	-6	0	-3	-6	0	-3	-6
LL14678-1	Circular	2	2	2	2	2	2	2	2	2
LL14678-2	Natural	0	-2	-4	0	-2	-4	0	-2	-4
LL14731-1	Circular	2	3	3	2	3	3	2	3	3
LL14731-2	Natural	0	-4	7	0	-4	7	0	-4	7
LL14732-1	Circular	2	2	2	2	2	2	2	2	2
LL14732-2	Natural	0	0	0	0	0	0	0	0	0
LL14897-1	Circular	4	4	3	4	4	3	4	4	3
LL14897-2	Natural	1	6	11	1	6	11	1	6	11
LL14973-1	Circular	9	10	8	9	10	8	9	10	8
LL14973-2	Natural	0	8	24	0	8	24	0	8	24
LL14975-1	Circular	10	14	10	10	14	10	10	14	10
LL14975-2	Natural	0	3	22	0	3	22	0	3	22
LL14984-1	Circular	9	9	8	9	9	8	9	9	8
LL14984-2	Natural	0	11	26	0	11	26	0	11	26
LL14988-1	Circular	38	49	62	38	49	64	38	49	62
LL14988-2	Natural	0	0	0	0	0	0	0	0	0
LL14989-1	Circular	46	62	77	47	63	78	48	65	81
LL14989-2	Natural	0	0	0	0	0	0	0	0	0
LL14992-1	Circular	2	2	2	2	2	2	2	2	2
LL14992-2	Natural	0	0	0	0	0	0	0	0	0
LL15000-1	Circular	16	23	24	16	23	24	16	23	24
LL15000-2	Natural	0	0	28	0	0	28	0	0	28
LL15004-1	Circular	23	32	41	23	32	41	23	31	41
LL15004-2	Natural	0	0	-40	0	0	-44	0	0	-40
LL15005-1	Circular	23	32	36	23	32	36	23	31	37
LL15005-2	Natural	0	10	51	0	11	52	0	10	50
LL15005-3	Natural	0	11	79	0	12	81	0	11	79
LL15011-1	Circular	23	32	46	23	32	46	23	31	46
LL15011-2	Natural	0	0	28	0	0	34	0	0	27
LL15012-1	Circular	38	49	60	38	49	60	38	49	60
LL15012-2	Natural	0	0	7	0	0	15	0	0	8
LL15020-1	Circular	111	144	165	113	147	167	111	145	167
LL15020-2	Natural	0	0	0	0	0	0	0	0	0
LL15327-1	Circular	68	82	88	69	84	90	66	80	85
LL15327-2	Natural	0	0	0	0	0	0	0	0	0
LL15410-1	Circular	68	83	88	69	84	90	67	80	85
LL15410-2	Natural	0	0	0	0	0	0	0	0	0
LL15417-1	Circular	6	6	5	6	6	5	6	6	5
LL15417-2	Natural	0	-3	-5	0	-3	-5	0	-3	-5
LL15484-1	Circular	6	6	5	6	6	5	6	6	5
LL15484-2	Natural	0	-2	-4	0	-2	-4	0	-2	-4
LL15576-1	Circular	7	8	8	7	8	8	7	8	8
LL15576-2	Natural	0	-2	-23	0	-2	-24	0	1	-21
LL15576-3	Natural	0	7	34	0	8	36	0	5	31
LL15577-1	Circular	7	8	7	7	8	7	7	8	8
LL15577-2	Natural	0	2	6	0	2	6	0	2	6

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LL15577-3	Natural	0	6	17	0	6	17	0	6	17
LL15578-1	Circular	7	8	7	7	8	8	7	8	8
LL15578-2	Natural	0	1	4	0	1	4	0	0	4
LL15581-1	Circular	-18	-20	-18	-18	-20	-18	-18	-20	-19
LL15581-2	Natural	0	0	0	0	0	0	0	0	0
LL15583-1	Circular	23	26	26	23	26	26	23	27	27
LL15583-2	Natural	0	0	0	0	0	0	0	0	0
LL15587-1	Circular	25	33	30	25	33	29	25	33	33
LL15587-2	Natural	0	0	0	0	0	0	0	0	0
LL15588-1	Circular	23	27	26	23	27	26	23	27	27
LL15588-2	Natural	0	0	0	0	0	0	0	0	0
LL15588-3	Natural	0	0	0	0	0	0	0	0	0
LL15591-1	Circular	17	19	18	17	19	18	17	19	19
LL15591-2	Natural	0	0	0	0	0	0	0	0	0
LL15593-1	Special	31	31	31	31	31	31	31	32	32
LL15593-2	Natural	0	0	0	0	0	2	0	0	0
LL15594-1	Circular	33	34	32	32	34	32	33	35	34
LL15594-2	Natural	0	0	2	0	0	3	0	0	1
LL15595-1	Circular	33	35	32	33	35	32	33	35	34
LL15595-2	Natural	0	0	7	0	1	7	0	0	7
LL15596-3	Natural	0	1	16	0	2	17	0	0	15
LL15598-1	Circular	28	29	27	28	29	27	28	29	27
LL15598-2	Natural	0	0	0	0	0	0	0	0	0
LL15600-1	Circular	26	27	25	26	27	25	26	27	25
LL15600-2	Natural	0	0	0	0	0	0	0	0	0
LL15614-1	Circular	36	39	42	36	39	44	36	41	44
LL15614-2	Natural	0	0	0	0	0	0	0	0	0
LL15653-1	Special	5	6	5	5	6	5	5	6	6
LL15653-2	Natural	0	3	9	0	4	9	0	3	9
LL15854-1	Circular	26	27	25	26	27	25	26	27	25
LL15854-2	Natural	0	0	0	0	0	0	0	0	0
LL15857-1	Circular	-24	-25	-24	-24	-25	-24	-24	-25	-24
LL15857-2	Natural	0	0	0	0	0	0	0	0	0
LL15859-1	Circular	24	25	24	24	25	24	24	25	24
LL15859-2	Natural	0	0	-2	0	0	-1	0	0	-1
LL15861-1	Circular	15	16	16	14	15	15	14	15	16
LL15861-2	Natural	2	13	39	2	13	39	2	13	39
LL15862-1	Circular	23	24	23	23	24	23	23	24	23
LL15862-2	Natural	6	31	77	6	31	77	5	30	77
LL15862-3	Natural	2	30	72	2	31	72	2	30	72
LL15867-1	Circular	11	13	13	11	13	13	11	13	13
LL15867-2	Natural	0	6	25	0	6	25	0	6	25
LL15868-1	Circular	14	15	15	14	15	15	14	15	15
LL15868-2	Natural	0	7	28	0	7	28	0	7	28
LL15870-1	Circular	11	12	12	11	12	12	11	12	12
LL15870-2	Natural	1	14	33	1	14	33	1	14	33
LL15870-3	Natural	1	19	44	1	19	44	1	19	44
LL16039-1	Circular	2	2	2	2	2	2	2	2	2
LL16039-2	Natural	0	0	0	0	0	0	0	0	0
LL16086-1	Circular	2	2	2	2	2	2	2	2	2
LL16086-2	Natural	0	0	0	0	0	0	0	0	0

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LL16092-1	Circular	5	6	5	5	6	5	5	6	5
LL16092-2	Natural	0	2	5	0	2	5	0	2	5
LL16228-1	Circular	5	6	5	5	6	5	5	6	5
LL16228-2	Natural	0	1	4	0	1	4	0	1	4
LL16228-3	Natural	0	3	7	0	3	7	0	3	7
LL16313-1	Circular	2	2	2	2	2	2	2	2	2
LL16313-2	Natural	0	2	4	0	2	4	0	2	4
LL16318-1	Circular	2	3	3	2	3	3	2	3	3
LL16318-2	Natural	0	0	2	0	0	2	0	0	2
LLORINGPK	Circular	667	701	756	664	703	758	665	705	761
LM13902-1	Circular	2	4	3	2	4	3	2	4	3
LM13902-2	Natural	0	0	3	0	0	3	0	0	3
LM13907-1.	Circular	3	7	8	3	8	8	3	6	8
LM13907-2.	Natural	0	0	0	0	0	0	0	0	0
LM14065-1.	Circular	-6	6	8	-6	-11	8	-4	-9	8
LM14065-2.	Natural	0	0	0	0	0	0	0	0	0
LM14081-1.	Circular	-6	-9	8	-9	-9	8	-6	9	8
LM14081-2.	Natural	0	0	0	0	0	0	0	0	0
LM14234-1.	Circular	-8	-15	8	-6	-9	7	-7	-13	7
LM14234-2.	Natural	0	0	1	0	0	1	0	0	1
LM14296-2	Natural	8	20	43	9	20	43	8	20	43
LM14347-3.	Natural	14	31	66	14	31	66	14	31	66
LM14368-1	Circular	25	27	27	26	27	27	26	27	27
LM14368-2	Natural	0	9	24	0	11	26	0	10	26
LM14368-3	Natural	0	9	25	0	11	27	0	11	27
LM14370-1	Circular	27	29	28	29	29	28	29	28	28
LM14370-2	Natural	0	8	23	0	9	24	0	9	24
LM14370-3	Natural	0	8	23	0	9	24	0	9	24
LM14371-1	Circular	39	37	36	41	38	36	40	38	37
LM14371-2	Natural	0	31	74	0	32	75	0	32	75
LM14372-1	Circular	25	27	26	26	27	27	26	27	26
LM14372-2	Natural	0	10	24	0	11	27	0	11	27
LM14373-1	Circular	27	28	28	29	28	28	29	29	28
LM14373-2	Natural	0	6	21	0	7	22	0	7	22
LM14374-1	Circular	25	27	26	26	27	26	26	27	26
LM14374-2	Natural	0	13	30	0	14	32	0	14	32
LM14520-1	Circular	39	39	39	41	39	39	40	39	39
LM14520-2	Natural	0	15	54	0	15	56	0	15	56
LM14578-1	Circular	6	9	9	6	9	9	6	9	9
LM14578-2	Natural	0	-1	-9	0	-1	-9	0	-1	-9
LM14656-1	Circular	39	38	37	41	37	38	41	38	38
LM14656-2	Natural	0	21	64	0	22	65	0	22	65
LM14695-1	Circular	-4	-5	-5	-4	-5	-5	-4	-5	-5
LM14695-2	Natural	0	0	0	0	0	0	0	0	0
LM14714-1	Circular	8	8	7	8	8	7	8	8	7
LM14714-2	Natural	0	0	0	0	0	0	0	0	0
LM14877-1	Circular	7	8	7	7	8	7	7	8	7
LM14877-2	Natural	0	0	0	0	0	0	0	0	0
LM14899-1	Circular	39	47	46	41	47	46	41	48	47
LM14899-2	Natural	0	45	85	0	46	86	0	45	88
LM15022-1	Circular	114	195	235	114	199	237	120	201	302

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LM15022-2	Natural	0	0	-211	0	0	-213	0	0	-134
LM15024-1	Circular	93	148	145	93	148	143	96	166	166
LM15024-2	Natural	0	77	418	0	86	424	0	33	406
LM15026-1	Circular	93	113	113	93	113	113	96	119	119
LM15026-2	Natural	0	132	400	0	137	408	0	128	394
LM15027-1	Circular	96	108	107	97	108	107	99	111	111
LM15027-2	Natural	0	161	411	0	165	418	0	160	410
LM15041-1	Circular	54	60	61	53	60	60	55	62	64
LM15041-2	Natural	0	99	289	0	102	292	0	99	292
LM15102-1	Circular	17	17	17	17	17	17	17	17	17
LM15102-2	Natural	20	66	148	20	66	148	20	66	148
LM15104-1	Circular	20	19	19	20	18	19	20	19	19
LM15104-2	Natural	19	66	147	19	66	147	19	66	147
LM15107-1	Circular	26	24	25	26	26	24	26	25	25
LM15107-2	Natural	16	64	145	17	64	145	16	64	145
LM15108-1	Circular	27	28	28	27	28	28	27	29	28
LM15108-2	Natural	12	60	141	13	60	141	11	60	141
LM15112-1	Circular	28	31	30	28	32	33	27	34	32
LM15112-2	Natural	3	61	144	5	61	144	1	61	144
LM15115-1	Circular	28	35	38	28	35	36	28	37	35
LM15115-2	Natural	0	60	142	0	60	142	0	60	142
LM15119-1	Circular	33	42	42	34	42	42	33	43	42
LM15119-2	Natural	0	92	251	0	95	253	0	92	253
LM15123-1	Circular	33	46	43	34	46	43	33	46	43
LM15123-2	Natural	0	93	252	0	96	254	0	93	254
LM15131-1	Circular	33	49	47	34	49	48	33	52	50
LM15131-2	Natural	0	91	248	0	93	251	0	90	251
LMH148-2	Natural	0	1	14	0	1	14	0	1	14
LN16989-1	Circular	9	10	10	9	10	10	9	10	10
LN16989-2	Natural	0	11	17	0	11	18	0	11	19
LN16993-1	Circular	8	11	14	8	11	14	8	11	14
LN16993-2	Natural	0	0	-12	0	0	-13	0	0	-14
LN16996-1	Circular	8	11	14	8	11	14	8	11	14
LN16996-2	Natural	0	0	0	0	0	0	0	0	0
LN17001-1	Circular	15	19	22	15	19	22	15	19	22
LN17001-2	Natural	0	0	0	0	0	0	0	0	0
LN17001-3	Natural	0	0	0	0	0	0	0	0	0
LN17014-1	Circular	15	19	22	15	19	22	15	19	22
LN17014-2	Natural	0	0	0	0	0	0	0	0	0
LN17019	Circular	21	32	46	21	34	46	21	32	46
LO17382-1	Circular	136	170	209	136	170	209	137	170	209
LO17382-2	Natural	0	0	0	0	0	0	0	0	0
LO17590-1	Circular	10	10	9	10	10	9	10	10	9
LO17590-2	Natural	9	23	43	9	23	43	9	23	43
LO17593-1	Circular	4	4	4	4	4	4	4	4	4
LO17593-2	Natural	0	3	8	0	3	8	0	3	8
LO17595-1	Circular	10	9	9	10	9	9	10	9	9
LO17595-2	Natural	7	22	42	7	22	42	7	22	42
LO17606-1	Circular	11	9	9	11	9	9	11	9	9
LO17606-2	Natural	7	22	42	7	22	42	7	22	42
LO17608-1	Circular	18	15	16	18	15	16	18	15	16

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LO17608-2	Natural	1	12	27	1	12	27	1	12	27
LO17608-3	Natural	1	14	32	1	14	32	1	14	32
LO17620-1	Circular	18	16	16	18	16	16	18	16	16
LO17620-2	Natural	1	18	33	1	18	33	1	18	33
LO17636-1	Circular	29	32	28	29	32	28	29	32	28
LO17636-2	Natural	0	33	70	0	33	70	0	33	70
LO17675-1	Circular	8	8	8	8	8	8	8	8	8
LO17675-2	Natural	2	8	17	2	8	17	2	8	17
LO17675-3	Natural	3	11	23	3	11	23	3	11	23
LO17676-1	Circular	8	8	8	8	8	8	8	8	8
LO17676-2	Natural	0	5	15	0	5	15	0	5	15
LO17678-1	Circular	8	10	11	8	10	11	8	10	11
LO17678-2	Natural	0	0	8	0	0	8	0	0	8
LO17695-1	Circular	136	170	209	136	170	209	136	170	209
LO17695-2	Natural	0	0	0	0	0	0	0	0	0
LO17930-1	Circular	28	32	29	28	32	29	28	32	29
LO17930-2	Natural	0	21	57	0	21	57	0	21	57
LO17976-1	Circular	124	152	175	124	153	175	124	152	175
LO17976-2	Natural	0	0	0	0	0	0	0	0	0
LO17980-1	Circular	27	30	30	27	30	30	27	30	30
LO17980-2	Natural	0	16	53	0	16	53	0	16	54
LO17993-1	Circular	2	2	2	2	2	2	2	2	2
LO17993-2	Natural	4	9	13	4	9	13	4	9	13
LO18000-1	Circular	0	0	0	0	0	0	0	0	0
LO18000-2	Natural	0	0	0	0	0	0	0	0	0
LO18017-1	Circular	3	3	3	3	3	3	3	3	3
LO18017-2	Natural	0	0	0	0	0	0	0	0	0
LO18063-1	Circular	124	152	175	124	152	175	124	152	175
LO18063-2	Natural	0	0	0	0	0	0	0	0	0
LO18169-1	Circular	4	6	6	4	6	6	4	6	6
LO18169-2	Natural	0	1	7	0	1	7	0	1	7
LO18170-1	Circular	4	7	7	4	7	7	4	7	7
LO18170-2	Natural	0	0	6	0	0	6	0	0	6
LO18174-1	Circular	108	136	144	108	136	144	108	136	144
LO18174-2	Natural	0	0	-85	0	0	-84	0	0	-85
LO18175-1	Circular	4	6	5	4	6	6	4	6	5
LO18175-2	Natural	0	1	8	0	1	8	0	1	8
LO18178-1	Circular	16	16	16	16	16	16	16	16	16
LO18178-2	Natural	22	82	171	22	82	171	23	82	171
LO18181-1	Circular	122	149	169	122	149	169	122	149	169
LO18181-2	Natural	0	0	0	0	0	0	0	0	0
LO18184-1	Circular	28	24	26	28	24	26	28	24	26
LO18184-2	Natural	0	64	156	0	64	156	0	64	156
LO18186-1	Circular	109	137	152	109	137	152	109	137	153
LO18186-2	Natural	0	0	0	0	0	0	0	0	0
LO18187-1	Circular	28	24	26	28	24	26	28	24	26
LO18187-2	Natural	0	62	154	0	62	154	0	62	154
LO18191-1	Circular	117	144	164	117	144	164	118	144	164
LO18191-2	Natural	0	0	0	0	0	0	0	0	0
LO18192-1	Circular	58	58	57	58	58	57	58	58	57
LO18192-2	Natural	0	86	222	0	86	222	0	86	223

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LO18193-1	Circular	58	60	60	58	60	60	58	60	60
LO18193-2	Natural	0	80	270	0	80	270	0	80	271
LO18346-1	Circular	-3	-4	-4	-3	-4	-4	-3	-4	-4
LO18346-2	Natural	0	0	0	0	0	0	0	0	0
LO18370-1	Circular	5	5	5	5	5	5	5	5	5
LO18370-2	Natural	0	0	0	0	0	0	0	0	0
LO18525-1	Circular	-37	-39	-37	-37	-39	-37	-37	-39	-37
LO18525-2	Natural	0	204	148	0	208	155	0	207	153
LO18600-1	Circular	3	3	3	3	3	3	3	3	3
LO18600-2	Natural	0	0	0	0	0	0	0	0	0
LO18601-1	Circular	2	2	2	2	2	2	2	2	2
LO18601-2	Natural	0	0	0	0	0	0	0	0	0
LO18618-1	Circular	2	2	2	2	2	2	2	2	2
LO18618-2	Natural	0	0	0	0	0	0	0	0	0
LO18634-1	Circular	37	40	39	37	40	39	37	40	39
LO18634-2	Natural	0	13	48	0	13	48	0	13	48
LO18777-1	Circular	37	40	38	37	40	38	37	40	38
LO18777-2	Natural	0	16	44	0	16	43	0	16	44
LO18890-1	Circular	17	18	17	17	18	17	17	18	19
LO18890-2	Natural	0	0	3	0	0	3	0	0	3
LO18891-1	Circular	18	20	17	18	20	17	18	20	17
LO18891-2	Natural	0	0	0	0	0	0	0	0	0
LO18894-1	Circular	15	18	16	15	18	15	15	18	17
LO18894-2	Natural	0	0	0	0	0	0	0	0	0
LO18901-1	Circular	4	4	3	3	4	3	-2	2	5
LO18901-2	Natural	1	1	-2	1	-1	-2	1	-1	-2
LO18902-1	Circular	8	9	8	8	9	8	8	9	9
LO18902-2	Natural	0	5	8	0	5	8	0	5	8
LO18907-1	Circular	12	11	11	12	11	11	12	11	11
LO18907-2	Natural	0	-2	-3	0	-2	-3	0	-2	-3
LO18907-3	Natural	8	34	69	8	34	69	8	34	69
LO18910-1	Circular	12	11	11	12	11	11	12	11	11
LO18910-2	Natural	0	0	-2	0	0	-2	0	0	-2
LO18926-1	Circular	8	9	10	8	9	10	8	9	10
LO18926-2	Natural	0	0	1	0	0	1	0	0	1
LO18928-1	Circular	16	18	16	16	18	15	16	18	17
LO18928-2	Natural	0	0	2	0	0	2	0	0	2
LO18928-3	Natural	0	0	2	0	0	2	0	0	2
LO18929-1	Circular	12	11	11	12	11	11	12	11	13
LO18929-2	Natural	0	0	-1	0	0	-1	0	0	-1
LO18930-1	Circular	8	11	9	9	11	9	8	11	9
LO18930-2	Natural	0	1	5	0	1	5	0	1	5
LO18930-3	Natural	0	2	12	0	2	12	0	2	12
LO18932-1	Circular	8	10	10	8	10	10	8	10	10
LO18932-2	Natural	0	0	0	0	0	0	0	0	0
LO18936-1	Circular	3	5	4	3	5	4	3	5	4
LO18936-2	Natural	0	-4	-10	0	-4	-10	0	-4	-10
LO18941-1	Circular	1	3	3	1	3	3	1	3	3
LO18941-2	Natural	0	0	1	0	0	1	0	0	1
LO19015-1	Circular	8	7	4	8	5	4	8	5	4
LO19015-2	Natural	6	17	34	6	17	34	6	17	34

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LO19212-1	Circular	2	3	2	2	3	2	2	3	2
LO19212-2	Natural	0	4	7	0	4	7	0	4	7
LO19213-1	Circular	3	3	3	3	3	3	3	3	3
LO19213-2	Natural	0	0	0	0	0	0	0	0	0
LO19213-3	Natural	12	27	48	12	27	48	12	27	48
LO19272-1	Circular	7	5	5	7	5	5	7	5	5
LO19272-2	Natural	6	16	32	6	16	31	6	16	31
LO19355-1	Circular	6	5	5	6	5	5	6	5	5
LO19355-2	Natural	6	17	33	6	17	33	6	17	33
LO19440-1	Circular	3	2	2	3	2	2	3	2	2
LO19440-2	Natural	4	9	15	4	9	15	4	9	15
LO19446-1	Circular	4	4	4	4	4	4	4	4	4
LO19446-2	Natural	7	15	26	7	15	26	7	15	26
LO19452-1	Circular	4	2	2	4	2	2	4	2	2
LO19452-2	Natural	-3	-6	-12	-3	-6	-12	-3	-6	-12
LO19455-1	Circular	3	2	2	3	2	2	3	2	2
LO19455-2	Natural	3	6	10	3	6	10	3	6	10
LP16324-1	Circular	2	3	3	2	3	3	2	3	3
LP16324-2	Natural	0	1	1	0	1	1	0	1	1
LP16324-3	Natural	0	1	2	0	1	2	0	1	2
LP16327-1	Circular	2	3	3	2	3	3	2	3	3
LP16327-2	Natural	0	1	2	0	1	2	0	1	2
LP16380-1	Circular	6	9	9	6	9	9	6	9	9
LP16380-2	Natural	0	2	8	0	2	8	0	2	8
LP16518-1	Circular	3	4	5	3	5	5	3	4	5
LP16518-2	Natural	0	0	0	0	0	0	0	0	0
LP16521-1	Circular	3	4	4	3	4	4	3	4	4
LP16521-2	Natural	0	1	2	0	1	2	0	1	2
LP16521-3	Natural	0	1	3	0	1	3	0	1	3
LP16533-1	Circular	3	4	4	3	4	4	3	4	4
LP16533-2	Natural	0	0	2	0	0	2	0	0	2
LP16672-1	Circular	13	18	17	13	18	17	13	18	17
LP16672-2	Natural	0	4	17	0	4	17	0	4	17
LP16727-1	Circular	2	3	3	2	3	3	2	3	3
LP16727-2	Natural	0	0	0	0	0	0	0	0	0
LP17018-1	Circular	3	3	3	3	3	3	3	3	3
LP17018-2	Natural	0	2	5	0	2	5	0	2	5
LP17024-1	Circular	3	2	2	3	2	2	3	2	2
LP17024-2	Natural	1	3	6	1	3	6	1	3	6
LP17026-1	Circular	9	8	8	9	8	8	9	8	8
LP17026-2	Natural	1	6	16	1	6	16	1	6	16
LP17026-3	Natural	1	5	12	1	5	12	1	5	12
LP17032-1	Circular	16	17	15	16	17	15	16	17	15
LP17032-2	Natural	0	-27	-48	0	-27	-48	0	-27	-48
LP17041-1	Circular	11	11	10	11	11	10	11	11	10
LP17041-2	Natural	0	-8	-13	0	-8	-13	0	-8	-13
LP17046-1	Circular	8	7	8	8	7	8	8	7	8
LP17046-2	Natural	0	0	0	0	0	0	0	0	0
LP17051-1	Circular	5	5	5	5	5	5	5	5	5
LP17051-2	Natural	0	2	6	0	2	6	0	2	6
LP17051-3	Natural	0	3	7	0	3	7	0	3	7

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LP17061-1	Circular	17	16	15	17	17	15	17	17	15
LP17061-2	Natural	4	26	63	4	26	63	4	26	63
LP17190-1	Circular	17	17	17	17	17	17	17	17	17
LP17190-2	Natural	0	19	56	0	19	56	0	19	56
LP17211-1	Circular	39	44	39	39	43	39	39	43	39
LP17211-2	Natural	0	13	56	0	13	55	0	13	55
LP17272-1	Circular	2	3	3	2	3	3	2	3	3
LP17272-2	Natural	0	0	0	0	0	0	0	0	0
LP17309-1	Circular	16	15	12	16	15	12	16	15	12
LP17309-2	Natural	9	27	62	9	27	62	9	28	62
LP17357-1	Circular	2	2	2	2	2	2	2	2	2
LP17357-2	Natural	1	-6	-7	1	-7	-7	1	-5	-7
LP17432-1	Circular	2	3	3	2	3	3	2	3	3
LP17432-2	Natural	0	2	7	0	2	7	0	2	7
LP17536-1	Circular	193	311	578	193	311	578	192	312	579
LP17536-2	Natural	0	0	0	0	0	0	0	0	0
LP17587-1	Circular	193	311	475	193	311	475	192	312	475
LP17587-2	Natural	0	0	104	0	0	103	0	0	104
LP17682-1	Circular	170	282	318	170	282	318	170	283	318
LP17682-2	Natural	0	0	366	0	0	365	0	0	366
LP17696-1	Circular	170	267	307	170	267	307	170	268	307
LP17696-2	Natural	0	-26	-222	0	-26	-222	0	-27	-221
LP17699-1	Circular	159	207	207	159	207	207	158	207	207
LP17699-2	Natural	0	174	502	0	174	501	0	175	502
LP17702-1	Circular	158	235	234	158	235	235	158	235	234
LP17702-2	Natural	0	96	519	0	96	518	0	97	519
LP17718-1	Special	116	153	152	117	153	152	116	153	152
LP17718-2	Natural	0	176	444	0	176	442	0	177	444
LP17719-1	Circular	147	187	187	147	187	187	147	187	187
LP17719-2	Natural	0	149	462	0	149	461	0	149	463
LP17720-1	Special	110	135	135	111	135	135	110	135	134
LP17720-2	Natural	0	169	422	0	169	420	0	169	422
LP17730-1	Special	110	124	124	111	124	124	110	124	124
LP17730-2	Natural	0	162	414	0	162	413	0	162	414
LP17736-1	Special	108	114	114	109	113	114	109	114	113
LP17736-2	Natural	1	190	434	3	190	433	1	191	434
LP17745-1	Special	103	102	104	104	101	102	103	102	103
LP17745-2	Natural	34	175	416	37	175	414	34	175	416
LP17754-1	Circular	3	4	4	3	4	4	3	4	4
LP17754-2	Natural	0	1	2	0	1	2	0	1	2
LP17754-3	Natural	0	1	3	0	1	3	0	1	3
LP17755-1	Special	94	92	92	94	94	94	94	91	92
LP17755-2	Natural	40	158	389	42	158	388	40	159	389
LP17772-1	Circular	4	5	5	4	6	4	3	5	5
LP17772-2	Natural	0	2	4	0	2	5	0	2	5
LP17801-1	Circular	5	6	5	5	6	6	5	6	5
LP17801-2	Natural	0	4	35	0	4	35	0	4	36
LP17806-1	Circular	3	3	3	3	3	3	3	3	3
LP17806-2	Natural	0	2	6	0	2	6	0	2	6
LP17813-1	Circular	3	3	3	3	3	3	3	3	3
LP17813-2	Natural	0	2	6	0	2	6	0	2	6

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LP17912-1	Circular	84	80	72	85	80	75	80	79	76
LP17912-2	Natural	49	154	350	50	154	350	49	155	351
LP17914-1	Circular	13	15	11	14	15	11	14	15	11
LP17914-2	Natural	2	18	40	2	18	40	2	18	40
LP17950-1	Circular	3	3	2	3	3	2	3	3	2
LP17950-2	Natural	3	8	16	3	8	16	3	8	16
LP17959-1	Circular	3	3	3	3	3	3	3	3	3
LP17959-2	Natural	5	11	19	5	11	18	5	11	19
LP17967-1	Circular	24	35	34	24	35	34	24	35	34
LP17967-2	Natural	0	25	96	0	25	96	0	25	96
LP17987-1	Circular	3	3	3	3	3	3	3	3	3
LP17987-2	Natural	3	8	14	3	8	14	3	8	14
LP17988-1	Circular	85	88	88	86	88	88	86	88	88
LP17988-2	Natural	3	100	287	3	100	287	3	100	288
LP17989-1	Circular	16	18	14	16	18	14	16	18	14
LP17989-2	Natural	2	22	52	2	22	52	2	22	52
LP17996-1	Circular	24	29	29	24	29	29	24	29	29
LP17996-2	Natural	0	39	96	0	39	96	0	39	96
LP18042-1	Circular	84	99	99	85	99	99	84	99	99
LP18042-2	Natural	0	89	277	0	90	276	0	90	277
LP18143-1	Circular	24	27	27	24	27	27	24	27	27
LP18143-2	Natural	0	40	96	0	40	96	0	40	96
LP18247-1	Circular	-16	-14	-14	-16	-14	-14	-16	-14	-14
LP18247-2	Natural	0	44	89	0	44	89	0	44	89
LP18255-1	Circular	12	11	11	12	11	11	12	11	11
LP18255-2	Natural	7	44	86	7	44	86	7	44	86
LP18260-1	Circular	11	10	10	10	10	10	10	10	10
LP18260-2	Natural	10	44	87	11	44	87	11	44	87
LP18270-1	Circular	10	10	10	10	10	10	10	10	10
LP18270-2	Natural	13	45	88	13	45	88	13	45	88
LP18354-1	Circular	6	8	6	6	8	6	6	8	6
LP18354-2	Natural	0	-1	-4	0	-1	-4	0	-1	-4
LP18354-3	Natural	1	8	19	1	8	19	0	8	19
LP18363-1	Circular	6	7	5	6	7	5	6	7	5
LP18363-2	Natural	0	0	0	0	0	0	0	0	0
LP18383-1	Circular	6	6	6	6	6	6	6	6	6
LP18383-2	Natural	0	0	0	0	0	0	0	0	0
LP18391-1	Circular	68	69	68	68	69	68	68	69	68
LP18391-2	Natural	1	113	293	2	113	292	1	113	293
LP18398-1	Circular	62	61	61	62	60	60	62	61	60
LP18398-2	Natural	22	120	293	23	119	292	22	120	293
LP18407-1	Circular	60	56	52	60	56	52	60	56	52
LP18407-2	Natural	63	171	341	64	171	340	63	171	341
LP18411-1	Circular	66	62	59	66	62	59	66	62	59
LP18411-2	Natural	12	103	279	13	103	279	12	103	279
LP18412-1	Circular	60	55	50	60	55	50	60	55	50
LP18412-2	Natural	22	111	275	23	111	274	22	111	275
LP18423-1	Circular	65	65	59	65	65	59	65	65	59
LP18423-2	Natural	9	87	245	9	87	245	9	87	245
LP18425-1	Circular	60	55	44	59	55	44	59	55	44
LP18425-2	Natural	15	90	229	16	90	229	15	90	229

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LP18433-1	Circular	32	26	26	32	26	27	32	26	28
LP18433-2	Natural	20	76	177	20	76	177	20	77	177
LP18434-1	Circular	49	36	35	47	36	35	47	36	35
LP18434-2	Natural	17	77	196	17	76	196	17	76	197
LP18440-1	Circular	23	21	20	23	21	20	23	21	20
LP18440-2	Natural	16	61	142	16	61	142	16	61	142
LP18442-1	Circular	33	29	29	32	29	29	33	29	29
LP18442-2	Natural	11	60	159	11	60	159	11	60	159
LP18447-1	Circular	27	30	21	27	29	21	27	29	21
LP18447-2	Natural	17	58	137	17	58	137	17	58	137
LP18448-1	Circular	31	32	22	31	32	22	31	32	22
LP18448-2	Natural	13	56	135	13	56	135	13	56	135
LP18450-1	Circular	33	36	31	33	35	31	33	35	31
LP18450-2	Natural	5	47	125	5	46	125	5	47	126
LP18451-1	Special	35	52	62	35	52	62	35	52	62
LP18451-2	Natural	1	25	91	1	25	91	1	25	91
LP18454-1	Circular	-22	-24	-18	-22	-24	-18	-22	-24	-18
LP18454-2	Natural	9	43	97	9	42	97	9	43	97
LP18455-1	Circular	23	24	24	23	24	24	23	24	24
LP18455-2	Natural	0	28	81	0	28	81	0	28	81
LP18460-1	Circular	11	12	9	11	12	9	11	12	9
LP18460-2	Natural	3	19	47	3	19	47	3	19	47
LP18461-1	Circular	10	10	10	10	10	10	10	10	10
LP18461-2	Natural	1	16	43	1	16	43	1	16	43
LP18479-1	Circular	7	7	7	7	7	7	7	7	7
LP18479-2	Natural	9	37	72	9	37	72	9	37	72
LP18497-1	Circular	22	22	17	23	23	17	21	23	17
LP18497-2	Natural	0	18	25	1	18	25	0	18	26
LP18503-1	Circular	6	5	5	5	5	5	5	5	5
LP18503-2	Natural	4	19	39	4	19	39	4	19	39
LP18506-1	Circular	6	6	6	6	6	6	6	6	6
LP18506-2	Natural	3	18	37	3	18	37	3	18	37
LP18510-1	Circular	7	6	6	7	6	6	7	6	6
LP18510-2	Natural	2	11	23	2	11	23	2	11	23
LP18589-1	Circular	2	2	2	3	2	2	3	2	2
LP18589-2	Natural	1	6	-7	1	6	5	1	6	5
LP18603-1	Circular	3	3	3	3	3	3	3	3	3
LP18603-2	Natural	-2	-8	-15	-3	-8	-15	-3	-8	-15
LP18610-1	Circular	8	8	8	8	8	8	8	8	8
LP18610-2	Natural	0	4	14	0	4	14	0	4	14
LP18653-1	Circular	3	3	3	3	3	3	3	3	3
LP18653-2	Natural	0	0	0	0	0	0	0	0	0
LP18658-1	Circular	3	2	2	3	2	2	3	2	2
LP18658-2	Natural	0	0	-9	0	0	-9	0	0	-9
LP18670-1	Circular	18	23	24	22	23	24	19	23	24
LP18670-2	Natural	0	0	0	0	0	0	0	0	0
LP18671-1	Circular	0	0	0	0	0	0	0	0	0
LP18671-2	Natural	0	0	0	0	0	0	0	0	0
LP18678-1	Circular	8	9	8	8	9	8	8	9	8
LP18678-2	Natural	0	3	12	0	3	12	0	3	12
LP18681-1	Circular	2	2	3	2	2	3	2	2	3

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LP18681-2	Natural	0	0	8	0	0	8	0	0	8
LP18699-1	Circular	0	0	0	0	0	0	0	0	0
LP18699-2	Natural	0	0	0	0	0	0	0	0	0
LP18748-1	Circular	8	9	8	8	9	8	8	9	8
LP18748-2	Natural	0	2	12	0	2	12	0	2	12
LP18795-1	Circular	19	23	24	24	23	24	19	23	24
LP18795-2	Natural	0	0	0	0	0	0	0	0	0
LP18854-1	Circular	3	3	3	3	3	3	3	3	3
LP18854-2	Natural	0	0	0	0	0	0	0	0	0
LP18882-1	Circular	0	0	0	0	0	0	0	0	0
LP18882-2	Natural	0	0	0	0	0	0	0	0	0
LP18943-1	Circular	19	23	21	23	24	21	19	23	21
LP18943-2	Natural	0	11	34	0	12	35	0	12	35
LP18949-1	Circular	6	5	5	6	5	5	6	5	5
LP18949-2	Natural	0	1	5	0	1	5	0	1	5
LP19003-1	Circular	2	3	4	2	3	4	2	3	3
LP19003-2	Natural	0	0	7	0	0	7	0	0	7
LP19019-1	Circular	6	6	6	6	6	6	6	6	6
LP19019-2	Natural	0	1	5	0	1	5	0	1	5
LP19021-1	Circular	6	6	6	6	6	6	6	6	6
LP19021-2	Natural	0	2	6	0	2	6	0	2	6
LP19021-3	Natural	2	10	20	2	10	20	2	10	20
LP19051-1	Circular	4	3	3	4	3	3	4	3	3
LP19051-2	Natural	2	6	11	2	6	11	2	6	11
LP19066-1	Circular	6	6	6	6	6	6	6	6	6
LP19066-2	Natural	0	1	5	0	1	5	0	1	5
LP19070-1	Circular	4	3	3	4	3	3	4	3	3
LP19070-2	Natural	2	6	12	2	6	12	2	6	12
LP19070-3	Natural	1	4	8	1	4	8	1	4	8
LP19092-1	Circular	4	4	6	5	4	6	4	4	6
LP19092-2	Natural	0	3	7	3	4	7	0	3	8
LP19097-1	Circular	3	4	4	3	4	4	3	4	4
LP19097-2	Natural	0	0	1	0	0	1	0	0	1
LP19101-1	Circular	3	4	4	3	4	4	3	4	4
LP19101-2	Natural	0	0	1	0	0	1	0	0	1
LP19101-3	Natural	0	0	1	0	0	1	0	0	1
LP19131-1	Circular	4	4	3	4	4	3	4	4	3
LP19131-2	Natural	0	0	0	0	0	0	0	0	0
LP19137-1	Circular	3	3	3	3	3	3	3	3	3
LP19137-2	Natural	0	0	0	0	0	0	0	0	0
LP19143-1	Circular	2	2	2	2	2	2	2	2	2
LP19143-2	Natural	1	2	3	1	2	3	1	2	3
LP19144-1	Circular	4	4	3	4	4	3	4	4	3
LP19144-2	Natural	0	1	2	0	1	2	0	1	2
LP19144-3	Natural	0	2	5	0	2	5	0	2	5
LP19145-1	Circular	2	2	2	2	2	2	2	2	2
LP19145-2	Natural	0	1	2	0	1	2	0	1	2
LP19147-1	Circular	3	3	2	3	3	2	3	3	2
LP19147-2	Natural	0	1	2	0	1	2	0	1	2
LP19147-3	Natural	1	2	3	1	2	3	1	2	3
LP19148-1	Circular	2	2	2	2	2	2	2	2	2

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LP19148-2	Natural	0	0	1	0	0	1	0	0	1
LP19148-3	Natural	0	1	2	0	1	2	0	1	2
LP19149-1	Circular	1	1	1	1	1	1	1	1	1
LP19149-2	Natural	0	1	1	0	1	1	0	1	1
LP19155-1	Circular	5	6	5	5	6	5	5	6	4
LP19155-2	Natural	0	8	22	0	8	22	0	8	22
LP19214-1	Circular	5	5	4	5	5	4	5	5	4
LP19214-2	Natural	0	-10	-20	0	-10	-20	0	-10	-20
LR113-1	Special	101	162	187	101	163	187	101	162	187
LR113-2	Natural	0	0	-73	0	0	-73	0	0	-71
LR12-1	Circular	5	6	6	5	6	6	5	6	6
LR121-1	Circular	7	8	8	7	8	8	7	8	8
LR121-2	Natural	0	8	21	0	8	21	0	8	21
LR12-2	Natural	0	1	5	0	1	5	0	1	5
LR124-1	Circular	7	8	8	7	8	8	7	8	8
LR124-2	Natural	0	7	20	0	7	20	0	7	20
LR127-1	Circular	12	11	10	12	11	10	12	11	10
LR127-2	Natural	8	-114	236	8	-116	240	8	-111	247
LR128-1	Special	60	81	84	60	82	83	60	82	66
LR128-2	Natural	0	157	242	0	149	216	0	146	274
LR130-1	Circular	7	8	8	7	8	8	7	8	8
LR130-2	Natural	0	9	22	0	9	22	0	9	22
LR13-1	Circular	5	6	6	5	6	6	5	6	6
LR13-2	Natural	0	0	6	0	0	6	0	0	6
LR132-1	Circular	61	95	93	61	89	99	61	89	88
LR132-2	Natural	0	146	222	0	151	-220	0	148	232
LR134-1	Circular	0	0	0	0	0	0	0	0	0
LR134-2	Natural	0	0	0	0	0	0	0	0	0
LR137-1	Special	79	122	127	80	122	127	79	122	127
LR137-2	Natural	0	-122	-177	0	-122	-164	0	-122	-179
LR139-1	Special	79	138	144	80	138	143	80	137	144
LR139-2	Natural	0	-87	-170	0	-88	-170	0	-84	-170
LR14	Circular	2	2	2	2	2	2	2	2	2
LR140-1	Circular	9	13	13	9	13	13	9	13	12
LR140-2	Natural	0	0	18	0	0	18	0	0	18
LR141-1	Circular	9	13	15	9	13	15	9	13	15
LR141-2	Natural	0	0	13	0	0	13	0	0	13
LR142-1	Circular	9	9	9	9	9	9	9	9	9
LR142-2	Natural	0	9	25	0	9	25	0	9	25
LR143-1	Circular	4	5	5	4	5	5	4	5	5
LR143-2	Natural	0	0	2	0	0	2	0	0	2
LR144-1	Circular	4	6	6	4	6	6	4	6	6
LR144-2	Natural	0	1	6	0	1	6	0	1	6
LR153-1	Special	53	52	-52	53	52	-52	53	52	-53
LR153-2	Natural	0	114	-200	0	113	-210	0	113	214
LR168-1	Circular	53	51	54	53	51	54	53	51	54
LR168-2	Natural	0	28	87	0	28	82	0	29	87
LR172-1	Circular	2	2	2	2	2	2	2	2	2
LR172-2	Natural	2	3	-7	2	3	-8	2	3	-7
LR191-1	Circular	43	43	35	43	44	35	43	46	35
LR191-2	Natural	0	-42	-100	0	-42	-100	0	-42	-100

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LR193-1	Circular	7	7	6	7	7	6	7	7	6
LR193-2	Natural	0	9	-27	0	9	27	0	9	-28
LR194-1	Circular	42	44	37	42	44	37	42	44	37
LR194-2	Natural	-29	-68	-133	-29	-68	-133	-29	-69	-133
LR195-1	Circular	42	44	37	42	44	37	42	48	37
LR195-2	Natural	-8	-64	-127	-8	-64	-127	-8	-64	-127
LR196-1	Circular	7	7	6	7	7	6	7	7	6
LR196-2	Natural	0	11	21	0	11	23	0	11	-20
LR197-1	Circular	6	13	13	6	13	13	6	13	13
LR197-2	Natural	0	1	13	0	1	13	0	1	13
LR198-1	Circular	7	7	6	7	7	6	7	7	6
LR198-2	Natural	2	12	24	2	12	24	2	12	24
LR199-1	Circular	6	13	13	6	13	13	6	13	13
LR199-2	Natural	0	0	13	0	0	13	0	0	13
LR200-1	Circular	8	8	9	8	8	9	8	9	9
LR200-2	Natural	0	0	0	0	0	0	0	0	0
LR201-1	Circular	7	8	6	7	8	6	7	8	6
LR201-2	Natural	3	13	27	3	13	27	3	13	27
LR202-1	Circular	4	3	3	4	3	3	4	3	3
LR202-2	Natural	3	7	13	3	7	13	3	7	13
LR205-1	Circular	5	5	5	5	5	5	5	5	5
LR205-2	Natural	0	3	8	0	3	8	0	3	8
LR206-1	Circular	5	5	5	5	5	5	5	5	5
LR206-2	Natural	0	3	8	0	3	8	0	3	8
LR206-3	Natural	0	2	6	0	2	6	0	2	6
LR231-1	Circular	26	21	21	26	21	21	26	21	21
LR231-2	Natural	17	48	105	16	48	104	17	49	105
LR232-1	Circular	23	21	21	23	21	21	23	21	21
LR232-2	Natural	15	48	107	15	48	107	15	48	107
LR233-1	Circular	2	2	2	2	2	2	2	2	2
LR233-2	Natural	-2	-4	-13	-2	-4	-12	-2	-4	-13
LR234-1	Circular	3	3	3	3	3	3	3	3	3
LR234-2	Natural	0	3	11	0	3	11	0	3	11
LR242-1	Circular	22	22	21	22	22	21	22	22	21
LR242-2	Natural	6	38	99	6	39	99	6	39	99
LR254-1	Circular	8	5	5	8	5	5	8	5	5
LR254-2	Natural	4	19	41	4	19	41	4	19	41
LR255-1	Circular	8	5	5	8	5	5	8	5	5
LR255-2	Natural	3	19	41	3	19	41	3	19	41
LR256-1	Circular	5	3	3	5	3	3	5	3	3
LR256-2	Natural	1	11	25	1	11	25	1	11	25
LR258-1	Circular	4	4	4	4	4	4	4	4	4
LR258-2	Natural	0	5	13	0	5	13	0	5	13
LR259-1	Circular	4	4	4	4	4	4	4	4	4
LR259-2	Natural	1	6	13	1	6	13	1	6	13
LR260-1	Circular	9	10	9	9	10	9	9	10	9
LR260-2	Natural	2	20	41	2	20	41	2	20	41
LR262-1	Circular	9	10	10	9	10	10	9	10	10
LR262-2	Natural	0	17	38	0	17	38	0	17	38
LR263-1	Circular	5	3	3	5	3	3	5	3	3
LR263-2	Natural	-3	-14	-29	-3	-14	-29	-3	-14	-29

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LR264-1	Circular	9	10	10	9	10	10	9	10	10
LR264-2	Natural	0	10	32	0	10	32	0	10	32
LR265-1	Circular	9	10	10	9	10	10	9	10	10
LR265-2	Natural	0	10	32	0	11	32	0	11	32
LR266-1	Circular	15	15	15	15	15	15	15	15	15
LR266-2	Natural	0	18	52	0	18	52	0	19	52
LR267-1	Circular	12	10	11	12	10	11	12	10	11
LR267-2	Natural	7	22	56	7	22	56	7	22	56
LR268-1	Circular	15	21	21	15	21	21	15	21	21
LR268-2	Natural	0	6	38	0	6	38	0	6	38
LR33-1	Circular	5	6	10	5	6	10	5	6	10
LR33-2	Natural	0	0	0	0	0	0	0	0	0
LR43	Circular	2	2	2	2	2	2	2	2	2
LR48-1	Circular	2	2	1	2	2	1	2	2	1
LR48-2	Natural	0	2	5	0	2	5	0	2	5
LR49-1	Circular	12	11	11	12	11	11	12	11	11
LR49-2	Natural	0	0	0	0	0	0	0	0	0
LR50-1	Circular	21	21	21	21	21	21	21	20	21
LR50-2	Natural	0	2	5	0	2	5	0	2	5
LR50-3	Natural	0	11	24	0	11	24	0	11	24
LR51-1	Circular	15	16	17	15	17	17	15	16	17
LR51-2	Natural	0	0	0	0	0	0	0	0	0
LR52-1	Circular	21	20	21	21	20	21	21	20	21
LR52-2	Natural	0	0	0	0	0	0	0	0	0
LR53-1	Circular	12	11	11	12	11	11	12	11	11
LR53-2	Natural	0	0	0	0	0	0	0	0	0
LR54-1	Circular	18	25	13	18	25	13	18	25	13
LR54-2	Natural	-17	-54	-33	-17	-71	-33	-18	-37	-56
LR56-1	Circular	29	32	31	29	32	31	29	32	31
LR56-2	Natural	0	2	14	0	2	14	0	2	14
LR56-3	Natural	0	2	16	0	2	16	0	2	16
LR57-1	Circular	29	32	31	29	32	31	29	32	31
LR57-2	Natural	0	0	6	0	0	6	0	0	6
LR58-1	Circular	2	2	2	2	2	2	2	2	2
LR58-2	Natural	0	8	25	0	8	25	0	8	25
LR60-1	Circular	30	32	31	30	32	31	30	32	31
LR60-2	Natural	0	0	0	0	0	0	0	0	0
LR6-1	Special	4	5	6	4	5	6	4	5	6
LR61-1	Circular	38	47	57	38	47	57	38	47	57
LR61-2	Natural	0	0	0	0	0	0	0	0	0
LR6-2	Natural	0	0	3	0	0	3	0	0	3
LR66-1	Circular	136	183	208	136	183	208	136	183	208
LR66-2	Natural	0	0	0	0	0	0	0	0	0
LR69-1	Circular	149	195	217	149	195	216	149	195	216
LR69-2	Natural	0	0	0	0	0	0	0	0	0
LR69-3	Natural	0	0	0	0	0	0	0	0	0
LR70-1	Special	153	208	225	153	208	224	154	206	223
LR70-2	Natural	0	0	0	0	0	0	0	0	0
LR7-1	Circular	5	6	5	5	6	5	5	6	5
LR7-2	Natural	0	0	5	0	0	5	0	0	5
LR75-1	Special	153	208	226	153	208	224	166	206	223

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LR75-2	Natural	0	0	0	0	0	0	0	0	0
LR78-1	Circular	8	8	6	8	8	6	8	8	6
LR78-2	Natural	0	19	48	0	19	48	0	19	48
LR8-1	Circular	3	3	3	3	3	3	3	3	3
LR81-1	Circular	7	8	6	7	8	6	7	8	6
LR81-2	Natural	0	19	48	0	19	47	0	19	48
LR8-2	Natural	0	3	8	0	3	8	0	3	8
LR82-1	Circular	31	44	26	23	49	31	-52	39	49
LR82-2	Natural	0	8	20	0	10	20	3	-6	19
LR83-1	Circular	7	8	8	7	8	8	7	8	8
LR83-2	Natural	0	13	43	0	13	43	0	13	43
LR86-1	Circular	18	33	-45	27	44	-45	29	33	-45
LR86-2	Natural	0	0	0	0	0	0	0	0	0
LR89-1	Circular	13	12	8	7	11	12	12	10	13
LR89-2	Natural	0	0	0	0	0	0	0	0	0
LR90-1	Circular	0	0	0	0	0	0	0	0	0
LR90-2	Natural	0	0	0	0	0	0	0	0	0
LR9-1	Circular	6	7	7	6	7	7	6	7	7
LR9-2	Natural	0	0	4	0	0	4	0	0	4
LR93-1	Circular	2	3	3	2	3	3	2	3	3
LR93-2	Natural	0	0	0	0	0	0	0	0	0
LR94-1	Circular	99	162	195	99	163	195	100	162	194
LR94-2	Natural	0	0	0	0	0	0	0	0	0
LR95-1	Circular	2	2	3	2	2	3	2	2	3
LR95-2	Natural	0	0	2	0	0	2	0	0	2
LS100.1	Circular	4	5	6	4	5	6	4	5	6
LS100.2	Natural	0	0	4	0	0	4	0	0	4
LS101.1	Circular	10	10	8	9	10	8	9	10	8
LS101.2	Natural	2	12	24	2	12	24	2	12	24
LS102.1	Circular	14	16	15	15	16	15	14	16	15
LS102.2	Natural	0	0	0	0	0	0	0	0	0
LS103.1	Circular	14	16	15	15	16	15	14	16	15
LS103.2	Natural	0	0	0	0	0	0	0	0	0
LS104.1	Circular	14	16	14	14	16	14	13	16	14
LS104.2	Natural	0	0	2	0	0	2	0	0	2
LS105.1	Special	26	31	33	26	31	33	26	31	33
LS106.1	Special	26	27	27	26	27	27	26	27	27
LS106.2	Natural	0	5	23	0	5	23	0	5	23
LS107.1	Special	25	27	25	26	27	25	25	27	25
LS107.2	Natural	0	6	25	0	6	25	0	6	25
LS109.1	Circular	9	9	7	9	9	7	8	9	7
LS109.2	Natural	1	11	24	1	11	24	1	11	24
LS110.1	Special	42	47	46	43	47	46	42	47	46
LS110.2	Natural	0	9	42	0	9	42	0	9	42
LS111.1	Special	42	45	38	43	45	38	42	45	38
LS111.2	Natural	0	18	54	0	18	54	0	18	54
LS112.1	Circular	35	32	24	36	32	23	36	32	24
LS113.1	Circular	24	42	52	25	42	52	25	42	52
LS113.2	Natural	0	5	41	0	4	40	0	5	41
LS114.1	Circular	25	35	47	26	35	47	26	35	47
LS114.2	Natural	1	11	46	1	11	46	1	11	46

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LS115.1	Circular	10	9	11	10	-11	11	10	9	11
LS116.1	Circular	18	26	38	21	26	38	21	26	38
LS116.2	Natural	0	0	16	0	0	16	0	0	16
LS117.1	Circular	20	27	45	22	27	45	22	27	45
LS117.2	Natural	0	0	11	0	0	11	0	0	11
LS118.1	Special	9	10	8	9	10	8	9	10	8
LS118.2	Natural	0	9	23	0	9	23	0	9	23
LS119.1	Circular	20	26	32	23	28	32	22	27	32
LS119.2	Natural	0	3	25	0	3	25	0	3	25
LS120.1	Circular	21	29	36	23	30	36	22	30	36
LS120.2	Natural	0	2	20	0	2	20	0	1	20
LS121.1	Circular	22	-30	24	23	-30	24	22	-30	24
LS121.2	Natural	0	7	36	0	8	36	0	7	36
LT19194-1	Circular	3	3	3	3	3	3	3	3	3
LT19194-2	Natural	0	0	1	0	0	1	0	0	1
LT19194-3	Natural	1	0	2	1	0	2	0	0	2
LT19249-1	Circular	-3	3	3	-3	3	3	-3	3	3
LT19249-2	Natural	0	0	1	0	0	1	0	0	1
LT19290-1	Circular	2	2	3	2	2	3	2	2	3
LT19290-2	Natural	0	0	0	0	0	0	0	0	0
LT19291-1	Circular	2	2	3	2	2	3	2	2	3
LT19291-2	Natural	0	0	0	0	0	0	0	0	0
LT19295-1	Circular	2	2	3	2	2	3	2	2	3
LT19295-2	Natural	0	0	0	0	0	0	0	0	0
LT19298-1	Circular	3	3	3	3	3	2	3	3	2
LT19298-2	Natural	0	1	1	0	1	1	0	1	1
LT19316-1	Circular	2	3	3	2	3	3	2	3	3
LT19316-2	Natural	0	1	4	0	1	4	0	1	4
LT19437-1	Circular	2	3	3	2	3	3	2	3	3
LT19437-2	Natural	0	0	0	0	0	0	0	0	0
LT19491-1	Circular	12	13	14	12	13	14	12	13	14
LT19491-2	Natural	0	0	0	0	0	0	0	0	0
LT19495-1	Circular	9	9	8	9	9	8	9	9	8
LT19495-2	Natural	0	0	0	0	0	0	0	0	0
LT19507-1	Circular	8	7	7	8	7	7	8	7	7
LT19507-2	Natural	0	0	0	0	0	0	0	0	0
LT19510-1	Circular	9	9	8	9	9	8	9	9	8
LT19510-2	Natural	0	0	0	0	0	0	0	0	0
LT19511-1	Circular	6	6	6	6	6	6	6	6	6
LT19511-2	Natural	0	0	4	0	0	4	0	0	4
LT19513-1	Circular	6	6	6	6	6	6	6	6	6
LT19513-2	Natural	0	0	4	0	0	4	0	0	4
LT19513-3	Natural	4	16	32	4	16	31	4	16	32
LT19638-1	Circular	65	63	58	64	64	58	65	64	59
LT19638-2	Natural	0	35	61	0	35	61	0	35	61
LT19641-1	Circular	65	86	111	65	86	111	65	86	111
LT19641-2	Natural	0	0	0	0	0	0	0	0	0
LT19643-1	Circular	65	86	99	65	86	99	65	86	99
LT19643-2	Natural	0	0	39	0	0	39	0	0	39
LT19643-3	Natural	0	0	88	0	0	87	0	0	88
LT19666-1	Circular	62	84	84	62	84	84	62	84	84

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LT19666-2	Natural	0	0	142	0	0	142	0	0	142
LT19672-1	Circular	62	76	76	62	76	76	62	76	76
LT19672-2	Natural	0	36	160	0	37	160	0	37	160
LT19678-1	Circular	64	74	71	64	75	71	64	75	71
LT19678-2	Natural	0	61	177	0	62	176	0	62	177
LT19695-1	Circular	59	63	63	59	64	63	59	63	63
LT19695-2	Natural	0	40	139	0	40	138	0	40	138
LT19696-1	Circular	63	76	65	63	77	65	63	77	65
LT19696-2	Natural	0	52	150	0	53	150	0	52	150
LT19701-1	Circular	54	62	55	54	62	55	54	62	55
LT19701-2	Natural	0	32	115	0	32	114	0	32	115
LT19703-1	Circular	56	63	55	56	63	55	56	63	55
LT19703-2	Natural	0	43	128	0	43	128	0	43	128
LT19704-1	Circular	45	49	45	44	49	45	45	49	45
LT19704-2	Natural	0	23	93	0	23	93	0	23	93
LT19705-1	Circular	44	50	46	44	50	46	44	49	46
LT19705-2	Natural	0	36	109	0	36	108	0	36	109
LT19708-1	Circular	36	39	39	36	39	39	36	39	40
LT19708-2	Natural	0	31	90	0	32	89	0	32	90
LT19709-1	Circular	10	10	10	10	10	10	10	10	10
LT19709-2	Natural	0	1	5	0	1	5	0	1	5
LT19710-1	Circular	24	31	30	24	32	30	24	32	30
LT19710-2	Natural	0	31	74	0	31	74	0	31	74
LT19712-1	Circular	24	30	27	24	28	29	24	28	28
LT19712-2	Natural	0	34	77	0	34	77	0	34	77
LT19713-1	Circular	12	13	12	12	13	12	12	13	12
LT19713-2	Natural	0	5	12	0	5	12	0	5	12
LT19714-1	Circular	10	10	10	10	10	10	10	10	10
LT19714-2	Natural	0	2	6	0	2	6	0	2	6
LT19715-1	Circular	25	28	24	25	28	24	25	28	24
LT19715-2	Natural	0	28	71	0	28	71	0	28	71
LT19716-1	Circular	27	30	26	27	30	26	27	30	26
LT19716-2	Natural	0	31	74	0	32	74	0	32	74
LT19717-1	Circular	26	30	25	26	30	25	26	30	25
LT19717-2	Natural	0	25	68	0	25	67	0	25	67
LT19718-1	Circular	5	-7	-7	5	-7	-7	5	-7	-7
LT19718-2	Natural	0	3	13	0	3	13	0	3	13
LT19718-3	Natural	8	21	37	8	21	36	7	21	37
LT19825-1	Special	75	83	78	75	83	78	75	84	78
LT19825-2	Natural	0	55	102	0	55	102	0	55	103
LT19855-1	Circular	72	86	86	72	87	86	72	86	86
LT19855-2	Natural	0	23	73	0	23	73	0	23	73
LT19868-1	Circular	12	13	15	12	13	15	12	13	15
LT19868-2	Natural	0	0	0	0	0	0	0	0	0
LT19878-1	Circular	2	2	2	2	2	2	2	2	2
LT19878-2	Natural	0	0	0	0	0	0	0	0	0
LT19878-3	Natural	4	10	19	4	10	19	4	10	19
LT19885-1	Circular	12	13	15	12	13	15	12	13	15
LT19885-2	Natural	0	0	0	0	0	0	0	0	0
LT19909-1	Circular	2	2	2	2	2	2	2	2	2
LT19909-2	Natural	0	0	0	0	0	0	0	0	0

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LT19918-1	Circular	77	98	104	77	98	104	77	98	104
LT19918-2	Natural	0	0	-55	0	0	-55	0	0	-55
LT19940-1	Circular	12	13	15	12	13	15	12	13	15
LT19940-2	Natural	0	0	0	0	0	0	0	0	0
LT19946-1	Circular	4	4	4	4	4	4	4	4	4
LT19946-2	Natural	0	11	13	0	8	13	0	10	13
LT19950-1	Circular	2	2	2	2	2	2	2	2	2
LT19950-2	Natural	0	0	0	0	0	0	0	0	0
LT20163-1	Circular	12	13	15	12	13	15	12	13	15
LT20163-2	Natural	0	0	0	0	0	0	0	0	0
LT20349-1	Circular	224	258	262	224	257	262	223	258	262
LT20349-2	Natural	0	0	9	0	0	9	0	0	9
LT20349-3	Natural	0	0	0	0	0	0	0	0	0
LT20353-1	Circular	223	248	266	223	248	266	223	249	266
LT20353-2	Natural	0	0	0	0	0	0	0	0	0
LT20357-1	Circular	215	226	237	215	225	237	214	226	237
LT20357-2	Natural	0	0	83	0	0	83	0	0	83
LT20358-1	Circular	224	255	266	224	255	266	223	254	266
LT20358-2	Natural	0	0	0	0	0	0	0	0	0
LT20375-1	Circular	60	67	77	60	67	77	60	67	78
LT20375-2	Natural	0	0	168	0	0	168	0	0	167
LT20405-1	Circular	214	225	246	214	225	246	214	225	246
LT20405-2	Natural	0	0	0	0	0	0	0	0	0
LT20429-1	Circular	60	67	75	60	67	75	60	67	75
LT20429-2	Natural	0	0	153	0	0	152	0	0	152
LT20452-1	Special	56	63	64	56	63	64	56	63	64
LT20452-2	Natural	0	0	227	0	0	227	0	0	227
LT20454-1	Circular	60	66	73	60	66	73	60	66	73
LT20454-2	Natural	0	0	156	0	0	156	0	0	156
LT20459-1	Circular	232	242	266	233	242	266	232	242	266
LT20459-2	Natural	0	0	0	0	0	0	0	0	0
LT20461-1	Circular	48	57	58	48	57	58	48	57	58
LT20461-2	Natural	0	0	111	0	0	110	0	0	111
LT20463-1	Circular	48	56	57	48	55	57	48	56	57
LT20463-2	Natural	0	0	131	0	0	131	0	0	131
LT20465-1	Circular	42	50	48	42	51	48	42	50	48
LT20465-2	Natural	0	55	166	0	47	166	0	56	166
LT20466-1	Circular	43	54	56	43	53	56	43	54	56
LT20466-2	Natural	0	17	127	0	12	127	0	17	127
LT20467-1	Circular	228	262	293	228	262	293	227	262	293
LT20467-2	Natural	0	0	0	0	0	0	0	0	0
LT20468-1	Circular	240	277	313	240	310	313	239	277	313
LT20468-2	Natural	0	0	0	0	0	0	0	0	0
LT20470-1	Circular	233	253	266	233	253	266	233	253	266
LT20470-2	Natural	0	0	0	0	0	0	0	0	0
LT20476-1	Circular	223	247	266	223	246	266	223	247	266
LT20476-2	Natural	0	0	0	0	0	0	0	0	0
LT20477-1	Circular	160	172	167	160	173	168	160	172	168
LT20477-2	Natural	0	0	0	0	0	0	0	0	0
LT20481-1	Circular	40	43	41	40	43	41	40	43	41
LT20481-2	Natural	0	46	123	0	44	123	0	46	123

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LT20483-1	Circular	40	45	43	40	45	43	40	45	43
LT20483-2	Natural	0	54	154	0	48	154	0	54	154
LT20498-1	Circular	30	37	37	30	37	37	30	37	37
LT20498-2	Natural	0	14	75	0	14	75	0	14	75
LT20499-1	Circular	30	32	33	30	32	33	30	32	33
LT20499-2	Natural	0	27	91	0	27	90	0	27	90
LT20507-1	Circular	21	20	20	21	20	20	21	20	20
LT20507-2	Natural	0	21	61	0	21	61	0	21	61
LT20511-1	Circular	21	20	20	21	20	20	21	20	20
LT20511-2	Natural	3	28	66	3	28	66	3	28	66
LT20520-1	Circular	-25	-25	-23	-25	-25	-23	-25	-25	-23
LT20520-2	Natural	0	37	88	0	37	88	0	37	88
LT20524-1	Circular	17	18	17	17	18	17	17	18	17
LT20524-2	Natural	3	17	37	3	17	37	3	17	37
LT20530-1	Circular	24	25	23	24	25	23	24	25	23
LT20530-2	Natural	0	30	80	0	30	80	0	30	80
LT20531-1	Circular	17	17	17	17	17	17	17	17	17
LT20531-2	Natural	7	21	41	7	21	41	7	21	41
LT20531-3	Natural	6	21	39	6	21	39	6	21	39
LT20551-1	Circular	13	14	14	13	14	14	13	14	14
LT20551-2	Natural	1	5	12	1	5	12	1	5	12
LT20568-1	Circular	5	5	6	5	5	6	5	5	6
LT20568-2	Natural	0	0	0	0	0	0	0	0	0
LT20621-1	Circular	2	5	6	2	3	6	2	5	6
LT20621-2	Natural	0	25	89	0	19	90	0	26	90
LT20640-1	Circular	4	4	4	4	4	4	4	4	4
LT20640-2	Natural	0	0	-33	0	0	-33	0	0	-33
LT20706-1	Circular	4	4	4	4	4	4	4	4	4
LT20706-2	Natural	0	0	32	0	0	32	0	0	32
LT20706-3	Natural	0	6	39	0	6	39	0	6	39
LT20713-1	Circular	4	4	4	4	4	4	4	4	4
LT20713-2	Natural	1	10	19	1	10	19	1	10	19
LT20714-1	Circular	2	2	2	2	2	2	2	2	2
LT20714-2	Natural	4	11	19	4	11	20	4	11	20
LT20738-1	Circular	5	5	6	5	5	6	5	5	6
LT20738-2	Natural	0	0	0	0	0	0	0	0	0
LT20751-1	Circular	106	111	111	106	109	113	106	111	112
LT20751-2	Natural	0	0	0	0	0	0	0	0	0
LT20761-1	Circular	2	4	4	2	3	4	2	4	4
LT20761-2	Natural	0	25	85	0	18	84	0	25	85
LT20831-1	Circular	2	4	3	2	4	3	2	4	3
LT20831-2	Natural	0	10	31	0	10	31	0	10	31
LT21001-1	Circular	106	124	112	106	124	112	106	124	112
LT21001-2	Natural	0	0	4	0	0	4	0	0	4
LT21152-1	Circular	93	114	115	93	114	115	93	114	115
LT21152-2	Natural	0	15	56	0	14	56	0	14	56
LT21168-1	Circular	100	117	104	100	115	104	101	116	104
LT21168-2	Natural	18	78	137	18	77	136	18	78	137
LT21168-3	Natural	0	86	268	0	85	268	0	86	268
LT21175-1	Special	90	98	95	90	96	95	90	96	95
LT21175-2	Natural	0	28	53	0	27	53	0	27	53

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LT21176-1	Circular	93	100	98	93	100	98	93	100	98
LT21176-2	Natural	0	34	78	0	34	78	0	34	78
LT21199-1	Circular	86	101	101	86	98	101	86	99	101
LT21199-2	Natural	0	0	9	0	0	9	0	0	9
LT21206-1	Circular	90	99	109	90	98	109	90	98	109
LT21206-2	Natural	0	0	0	0	0	0	0	0	0
LT21261-1	Circular	93	100	99	93	100	100	93	100	100
LT21261-2	Natural	0	0	33	0	0	33	0	0	33
LT21262-1	Circular	43	54	45	43	54	45	43	54	44
LT21262-2	Natural	0	5	32	0	3	32	0	5	32
LT21280-1	Circular	37	47	38	37	47	38	37	47	38
LT21280-2	Natural	0	1	0	0	0	0	0	2	0
LT21281-1	Circular	32	37	33	32	37	33	32	37	33
LT21281-2	Natural	0	2	0	0	0	0	0	2	0
LT21283-3	Natural	0	23	51	0	16	51	0	22	51
LT21290-1	Circular	-25	-28	-26	-25	-28	-26	-25	-28	-26
LT21290-2	Natural	0	7	37	0	7	37	0	7	37
LT21291-1	Circular	32	38	34	32	38	34	32	38	34
LT21291-2	Natural	0	5	36	0	4	36	0	4	36
LT21293-1	Circular	25	28	26	25	28	26	25	28	26
LT21293-2	Natural	0	5	34	0	5	34	0	5	34
LT21296-1	Circular	6	6	6	6	6	6	6	6	6
LT21296-2	Natural	0	5	11	0	5	11	0	5	11
LT21298-1	Circular	5	5	5	5	5	5	5	5	5
LT21298-2	Natural	1	6	13	1	6	13	1	6	13
LT21299-1	Circular	11	11	11	11	11	11	11	11	11
LT21299-2	Natural	2	8	15	2	8	14	2	8	15
LT21299-3	Natural	4	20	37	4	20	37	4	20	38
LT21300-1	Circular	4	4	4	4	4	4	4	4	4
LT21300-2	Natural	3	7	14	3	7	14	3	7	14
LT21305-1	Circular	24	29	25	24	29	25	24	29	25
LT21305-2	Natural	0	13	43	0	13	43	0	13	43
LT21308-1	Circular	17	18	17	17	18	17	17	18	17
LT21308-2	Natural	0	6	20	0	6	20	0	6	20
LT21311-1	Circular	11	11	11	11	11	11	11	11	11
LT21311-2	Natural	0	8	14	0	8	14	0	8	14
LT21320-1	Circular	17	20	20	17	20	20	17	20	20
LT21320-2	Natural	0	0	11	0	0	11	0	0	11
LT21320-3	Natural	0	0	9	0	0	9	0	0	9
LT21322-1	Circular	11	12	11	11	12	11	11	12	11
LT21322-2	Natural	0	0	-11	0	0	-11	0	0	-11
LT21359-1	Circular	52	59	65	52	59	65	52	59	65
LT21359-2	Natural	0	-11	-46	0	-8	-46	0	-11	-46
LT21439-1	Circular	56	62	67	56	63	67	56	62	67
LT21439-2	Natural	0	0	0	0	0	0	0	0	0
LT21890-1	Circular	56	74	67	56	74	67	56	74	67
LT21890-2	Natural	0	0	0	0	0	0	0	0	0
LT22070-1	Circular	13	19	15	13	19	15	13	19	15
LT22070-2	Natural	0	7	14	0	7	14	0	7	14
LT22072-1	Circular	21	29	34	21	29	34	21	29	34
LT22072-2	Natural	0	0	-1	0	0	-1	0	0	-1

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LT22077-1	Circular	12	15	13	12	15	13	12	15	13
LT22077-2	Natural	0	0	6	0	0	5	0	0	6
LT22077-3	Natural	0	0	3	0	0	3	0	0	3
LT22082-1	Circular	11	12	12	11	12	12	11	12	11
LT22082-2	Natural	0	3	10	0	3	10	0	3	10
LT22082-3	Natural	0	4	13	0	4	13	0	4	13
LT22083-1	Circular	5	4	4	5	5	4	5	4	4
LT22083-2	Natural	0	2	5	0	2	5	0	2	5
LT22083-3	Natural	0	2	5	0	2	5	0	2	5
LT22087-1	Circular	2	2	1	2	3	1	2	2	1
LT22087-2	Natural	0	1	2	0	1	2	0	1	2
LT22090-1	Circular	2	2	2	2	2	2	2	2	2
LT22090-2	Natural	0	0	1	0	0	1	0	0	1
LT22090-3	Natural	0	1	2	0	1	2	0	1	2
LT22096-1	Circular	38	48	47	38	48	47	38	48	47
LT22096-2	Natural	0	0	0	0	0	0	0	0	0
LT22233	Circular	2	2	2	2	2	2	2	2	2
LT22263	Circular	4	6	7	4	6	7	4	6	7
LT22683-1	Circular	34	40	40	34	40	40	34	40	40
LT22683-2	Natural	0	0	0	0	0	0	0	0	0
LT22803-1	Circular	33	41	39	33	41	39	33	41	39
LT22803-2	Natural	0	0	0	0	0	0	0	0	0
LT22808-1	Circular	30	36	38	30	36	38	30	36	38
LT22808-2	Natural	0	0	0	0	0	0	0	0	0
LT22811-1	Circular	30	36	34	30	36	34	30	36	34
LT22811-2	Natural	0	0	13	0	0	13	0	0	13
LT22812-3	Natural	0	0	17	0	0	17	0	0	17
LT22820-1	Circular	24	32	42	24	32	42	24	32	42
LT22820-1.	Circular	27	30	37	27	30	37	27	30	37
LT22820-2	Natural	0	0	4	0	0	4	0	0	4
LT22820-2.	Natural	0	0	4	0	0	4	0	0	4
LT22824-1	Circular	9	10	9	9	10	9	9	10	9
LT22824-2	Natural	0	11	36	0	11	36	0	11	36
LT22846-1	Circular	2	2	2	2	2	2	2	2	2
LT22846-2	Natural	0	0	0	0	0	0	0	0	0
LT22892-1	Circular	17	19	18	17	19	18	17	20	18
LT22892-2	Natural	0	0	3	0	0	2	0	0	3
LT22929-1	Circular	2	-2	-2	2	-2	-2	2	-2	-2
LT22929-2	Natural	0	0	0	0	0	0	0	0	0
LT22962-1	Circular	2	2	1	2	2	1	2	2	1
LT22962-2	Natural	0	1	1	0	1	1	0	1	1
LT23434-1	Circular	18	20	18	18	20	18	18	20	18
LT23434-2	Natural	0	0	3	0	0	3	0	0	3
LT23544-1	Circular	8	8	8	8	8	8	8	8	8
LT23544-2	Natural	0	1	21	0	1	20	0	1	21
LT23563-1	Circular	6	5	5	6	5	5	6	5	5
LT23563-2	Natural	0	-8	-27	0	-8	-27	0	-8	-27
LT23563-3	Natural	3	25	57	3	26	56	3	25	57
LT23565-1	Circular	6	-7	-7	6	-7	-7	6	-7	-7
LT23565-2	Natural	0	2	22	0	2	22	0	2	22
LT23647-1	Circular	5	9	5	5	9	7	5	9	7

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LT23647-2	Natural	0	1	4	0	1	4	0	1	5
LT23752-1	Circular	5	6	6	5	7	6	5	7	6
LT23752-2	Natural	0	0	0	0	0	0	0	0	0
LT24284-1	Circular	1	2	3	1	2	3	1	2	3
LT24284-2	Natural	0	0	0	0	0	0	0	0	0
LT24287-1	Circular	1	2	2	1	2	2	1	2	2
LT24287-2	Natural	0	0	1	0	0	1	0	0	1
LT24297-1	Circular	3	5	3	3	5	3	3	5	3
LT24297-2	Natural	0	1	1	0	1	1	0	1	1
LT24297-3	Natural	0	2	6	0	3	6	0	2	6
LT24301-1	Circular	0	0	0	0	0	0	0	0	0
LT24301-2	Natural	0	0	0	0	0	0	0	0	0
LT24319-1	Circular	1	2	2	1	2	2	1	2	2
LT24319-2	Natural	0	0	2	0	0	2	0	0	2
LT24331-1	Circular	5	8	6	5	8	6	5	8	6
LT24331-2	Natural	0	0	0	0	0	0	0	0	0
LT24339-1	Circular	5	7	6	5	7	6	5	7	6
LT24339-2	Natural	0	0	0	0	0	0	0	0	0
LT99991	Circular	-8	-8	-9	-8	-8	-9	-8	-8	-9
LT99992	Circular	-16	-18	-18	-16	-18	-18	-16	-18	-18
LU1471	Circular	15	14	16	15	14	16	14	14	16
LU1471-3	Natural	2	74	182	2	75	182	2	75	182
LU1474	Circular	5	-6	-8	5	-6	-8	5	-6	-8
LU1573	Circular	4	4	5	4	4	5	4	4	5
LU20747-1	Circular	5	5	5	5	5	5	5	5	5
LU20747-2	Natural	0	7	13	0	7	13	0	7	13
LU20790-1	Circular	5	6	5	5	6	5	5	6	5
LU20790-2	Natural	0	5	12	0	5	12	0	5	12
LU20795-1	Circular	3	4	4	3	4	4	3	4	4
LU20795-2	Natural	0	-20	398	0	-20	384	0	-20	392
LU20984-1	Circular	5	6	5	5	6	5	5	6	5
LU20984-2	Natural	0	5	13	0	5	13	0	5	13
LU21092-1	Circular	52	70	86	49	74	87	75	81	86
LU21092-2	Natural	0	0	0	0	0	0	0	0	0
LU21117-1	Circular	31	35	35	31	35	35	31	35	35
LU21117-2	Natural	0	118	641	0	118	619	0	118	652
LU21122-1	Circular	28	38	38	28	38	38	28	38	38
LU21122-2	Natural	0	106	279	0	106	279	0	106	279
LU21136-1	Circular	44	69	86	44	70	86	44	70	86
LU21136-2	Natural	0	0	0	0	0	0	0	0	0
LU21145-1	Circular	43	69	86	44	70	86	50	70	86
LU21145-2	Natural	0	0	0	0	0	0	0	0	0
LU21149-1	Circular	44	63	63	44	63	63	44	63	63
LU21149-2	Natural	0	-44	-219	0	-46	-221	0	-44	223
LU21149-4	Natural	0	60	368	0	60	375	0	60	367
LU21211-1	Special	23	27	27	23	27	27	23	27	27
LU21211-2	Natural	0	128	304	0	128	304	0	128	304
LU21226-1	Circular	7	10	9	7	10	9	7	10	9
LU21226-2	Natural	0	97	277	0	97	277	0	97	277
LU21230-1	Circular	7	14	14	7	14	14	7	14	14
LU21230-2	Natural	0	87	266	0	87	266	0	87	266

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LU21428-1	Circular	13	12	11	12	12	11	12	12	11
LU21428-2	Natural	0	17	37	0	17	37	0	17	37
LU21729-1	Circular	12	12	12	12	12	12	12	12	12
LU21729-2	Natural	2	18	38	2	18	38	2	18	38
LU21809-1	Circular	9	11	10	9	11	10	9	11	10
LU21809-2	Natural	0	6	20	0	6	20	0	6	20
LU21866-1	Circular	2	2	2	2	2	2	2	2	2
LU21866-2	Natural	0	0	0	0	0	0	0	0	0
LU21949-1	Circular	12	13	11	12	13	11	12	13	11
LU21949-2	Natural	6	20	40	6	20	40	6	20	40
LU21973-1	Circular	8	8	8	8	8	8	8	8	8
LU21973-2	Natural	0	4	11	0	4	11	0	4	11
LU21973-3	Natural	0	3	8	0	3	8	0	3	8
LU22005-1	Circular	3	5	6	3	5	6	3	5	6
LU22005-2	Natural	0	0	1	0	0	1	0	0	1
LU22005-3	Natural	0	0	1	0	0	1	0	0	1
LU22150-1	Circular	2	2	2	2	2	2	2	2	2
LU22150-2	Natural	0	0	0	0	0	0	0	0	0
LU22187-1	Circular	9	12	14	9	12	14	9	12	14
LU22187-2	Natural	0	2	14	0	2	14	0	2	14
LU22192-1	Circular	2	2	2	2	2	2	2	2	2
LU22192-2	Natural	0	0	0	0	0	0	0	0	0
LU22413-1	Circular	19	34	65	19	34	65	19	34	65
LU22413-2	Natural	0	0	0	0	0	0	0	0	0
LU22439-1	Circular	31	44	40	32	44	40	31	43	40
LU22439-2	Natural	0	0	301	0	70	300	0	71	300
LU22511-1	Circular	11	21	38	11	21	38	11	21	38
LU22511-2	Natural	0	0	0	0	0	0	0	0	0
LU22515-1	Circular	6	10	10	6	10	10	6	10	10
LU22515-2	Natural	0	5	14	0	5	14	0	5	14
LU22530-1	Circular	6	12	11	6	12	11	6	12	11
LU22530-2	Natural	0	1	12	0	1	12	0	1	12
LU22569-1	Circular	14	15	15	14	15	15	14	15	15
LU22569-2	Natural	0	41	81	0	41	88	0	42	81
LU22577-1	Circular	7	6	7	7	6	7	7	6	7
LU22577-2	Natural	7	22	-154	7	22	-176	7	22	-160
LU22580-1	Circular	3	6	8	3	6	8	3	6	8
LU22580-2	Natural	0	0	1	0	0	1	0	0	0
LU22587-1	Circular	6	6	6	6	6	6	6	6	6
LU22587-2	Natural	7	21	-79	7	21	-97	7	21	-82
LU22606-1	Circular	3	6	8	3	6	8	3	6	8
LU22606-2	Natural	0	0	1	0	0	1	0	0	1
LU22606-3	Natural	0	0	0	0	0	0	0	0	0
LU22634-1	Circular	7	8	7	7	8	7	7	8	7
LU22634-2	Natural	0	6	16	0	6	16	0	6	16
LU22749-1	Circular	4	5	4	4	5	4	4	5	4
LU22749-2	Natural	1	3	5	1	3	5	1	3	5
LU22749-3	Natural	1	4	8	1	4	8	1	4	8
LU22817-1	Circular	11	11	11	11	11	11	11	11	11
LU22817-2	Natural	0	13	35	0	13	35	0	13	35
LU22936-1	Circular	4	4	4	4	4	4	4	4	4

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LU22936-2	Natural	8	21	42	9	21	42	9	21	42
LU22941-1	Circular	7	8	8	7	8	8	7	8	8
LU22941-2	Natural	0	6	15	0	6	15	0	6	15
LU22942-1	Circular	2	2	2	2	2	2	2	2	2
LU22942-2	Natural	0	3	7	0	3	7	0	3	7
LU22980-1	Circular	4	4	4	4	4	4	4	4	4
LU22980-2	Natural	8	20	41	8	20	41	8	20	41
LU22986-1	Circular	7	7	7	7	7	7	7	7	7
LU22986-2	Natural	0	7	16	0	7	16	0	7	16
LU22990-1	Circular	2	3	3	2	3	3	2	3	3
LU22990-2	Natural	0	1	5	0	1	5	0	1	5
LU22992-1	Circular	-6	6	7	-6	6	7	-6	6	7
LU22992-2	Natural	0	0	-1	0	0	-1	0	0	-1
LU23200	Circular	37	45	58	41	45	58	38	45	58
LU23424-1	Circular	37	45	58	37	45	58	37	45	58
LU23424-2	Natural	0	0	0	0	0	0	0	0	0
LU23429-1	Circular	37	45	45	37	45	45	37	45	45
LU23429-2	Natural	0	0	29	0	0	29	0	0	29
LU23436-1	Circular	32	33	34	32	33	34	32	33	34
LU23436-2	Natural	0	4	19	0	4	19	0	4	19
LU23442-1	Circular	32	32	32	32	32	32	32	32	32
LU23442-2	Natural	0	6	19	1	6	19	1	6	19
LU23442-3	Natural	0	4	14	0	4	14	0	4	14
LU23445-1	Circular	28	30	33	28	30	33	28	30	33
LU23445-2	Natural	0	0	21	0	0	21	0	0	21
LU23449-1	Circular	28	30	30	28	30	30	28	30	30
LU23449-2	Natural	0	0	41	0	0	41	0	0	41
LU23450-1	Circular	28	30	34	28	30	34	28	30	34
LU23450-2	Natural	0	0	20	0	0	20	0	0	20
LU23453-1	Circular	28	29	29	28	29	29	28	29	29
LU23453-2	Natural	0	17	47	0	17	47	0	17	47
LU23453-3	Natural	0	31	87	0	32	87	0	31	87
LU23456-1	Circular	23	25	26	23	25	26	23	25	25
LU23456-2	Natural	3	50	119	3	50	119	3	50	119
LU23458-1	Circular	22	25	24	22	21	24	22	22	23
LU23458-2	Natural	6	50	120	6	50	120	6	50	120
LU23468-1	Circular	22	21	21	22	21	21	22	21	21
LU23468-2	Natural	3	43	112	3	43	112	3	43	112
LU23480-1	Circular	20	20	21	20	20	21	20	20	20
LU23480-2	Natural	0	39	106	0	40	106	0	39	106
LU23480-3	Natural	0	31	85	0	32	85	0	31	85
LU23482-1	Circular	14	14	15	14	14	15	14	14	15
LU23482-2	Natural	0	62	166	0	63	165	0	62	166
LU23496-1	Circular	14	14	15	14	14	15	14	14	15
LU23496-2	Natural	0	66	170	0	67	170	0	66	170
LU23501-1	Circular	14	14	15	14	14	15	14	14	15
LU23501-2	Natural	0	66	170	0	67	170	0	66	171
LU23502-1	Circular	17	17	18	17	18	18	17	18	18
LU23502-2	Natural	8	76	182	8	77	182	8	76	182
LU23512-1	Circular	12	13	13	12	13	13	12	13	13
LU23512-2	Natural	8	65	159	8	66	159	8	65	159

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LU23515-1	Circular	12	12	11	12	11	11	12	11	11
LU23515-2	Natural	10	68	161	10	69	161	10	68	161
LU23526-1	Circular	13	13	13	13	13	13	13	13	13
LU23526-2	Natural	15	76	167	15	77	167	15	76	167
LU23527-1	Circular	7	7	7	7	7	7	7	7	7
LU23527-2	Natural	6	46	103	6	47	103	6	46	103
LU23533-1	Circular	7	7	7	7	7	7	7	7	7
LU23533-2	Natural	0	41	98	0	42	98	0	41	98
LU23537-1	Circular	8	8	8	8	8	8	8	8	8
LU23537-2	Natural	7	47	103	7	48	102	7	47	103
LU23539-1	Circular	8	8	8	8	8	8	8	8	8
LU23539-2	Natural	8	47	103	8	48	104	8	47	103
LU23597-1	Circular	-4	-4	-5	-4	-4	-5	-4	-4	-5
LU23597-2	Natural	0	-1	-2	0	-1	-2	0	-1	-2
LU23733-1	Circular	-8	-9	-9	-8	-9	-9	-8	-9	-9
LU23733-2	Natural	0	1	3	0	1	3	0	1	3
LU23784-1	Circular	0	0	0	0	0	0	0	0	0
LU23784-2	Natural	0	0	0	0	0	0	0	0	0
LU23790-1	Circular	2	3	3	2	3	3	2	3	3
LU23790-2	Natural	0	0	-2	0	0	-2	0	0	-2
LU23819-1	Circular	-2	-1	0	-2	-1	0	-2	-1	0
LU23819-2	Natural	0	0	0	0	0	0	0	0	0
LU23888	Circular	19	25	27	17	28	27	18	28	27
LU24078-1	Circular	2	3	4	2	3	4	2	3	4
LU24078-2	Natural	0	0	0	0	0	0	0	0	0
LU24098-1	Circular	-3	-1	1	-3	-1	1	-3	-1	-1
LU24098-2	Natural	0	0	0	0	0	0	0	0	0
LU24127-1	Circular	16	23	31	17	23	31	17	24	31
LU24127-2	Natural	0	0	0	0	0	0	0	0	0
LU24145-1	Circular	12	16	25	12	16	25	12	16	25
LU24145-2	Natural	0	0	0	0	0	0	0	0	0
LU24159-1	Circular	11	15	17	11	15	17	11	15	17
LU24159-2	Natural	0	0	12	0	0	11	0	0	11
LU24161-1	Circular	11	15	15	11	15	15	11	15	15
LU24161-2	Natural	0	0	21	0	0	21	0	0	21
LU24164-1	Circular	10	12	12	10	12	12	10	12	12
LU24164-2	Natural	0	16	68	0	17	67	0	16	68
LU24165-1	Circular	11	14	14	11	14	14	11	14	14
LU24165-2	Natural	0	4	23	0	4	23	0	4	23
LU24165-3	Natural	0	7	49	0	7	49	0	7	49
LU24176-1	Circular	10	11	11	10	11	11	10	11	11
LU24176-2	Natural	0	-20	-70	0	-20	-70	0	-20	-70
LU24190-1	Circular	11	11	11	11	11	11	11	11	11
LU24190-2	Natural	6	25	75	6	25	75	6	25	75
LU24190-3	Natural	11	64	159	11	64	158	11	64	159
LU24191-1	Circular	6	6	6	6	7	6	6	6	6
LU24191-2	Natural	15	52	135	15	53	134	15	52	135
LU24201-1	Circular	6	6	6	6	6	6	6	6	6
LU24201-2	Natural	16	53	135	16	53	134	16	53	135
LU24206-1	Circular	8	8	8	8	8	8	8	8	8
LU24206-2	Natural	12	48	131	12	49	130	12	48	130

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LU24211-1	Circular	5	5	5	5	5	5	5	5	5
LU24211-2	Natural	11	28	51	11	28	51	11	28	51
LU24220-1	Circular	6	6	6	6	6	6	6	6	6
LU24220-2	Natural	6	18	35	6	19	35	6	18	35
LU24237-1	Circular	6	5	5	6	5	5	6	5	5
LU24237-2	Natural	7	19	36	7	19	36	7	19	36
LU24252-1	Circular	2	5	8	2	5	8	2	5	8
LU24252-2	Natural	0	0	0	0	0	0	0	0	0
LU24254-1	Circular	2	5	8	2	5	8	2	5	8
LU24254-2	Natural	0	0	1	0	0	0	0	0	0
LU24461-1	Circular	-2	-2	-1	-2	-2	-1	-2	-2	-1
LU24461-2	Natural	0	0	0	0	0	0	0	0	0
LU24515-1	Circular	2	2	1	2	2	2	2	2	2
LU24515-2	Natural	2	5	12	2	5	12	2	5	12
LU24771	Circular	45	60	63	38	60	62	38	60	63
LU24775-1	Circular	16	27	30	16	27	29	16	27	30
LU24775-2	Natural	0	0	0	0	0	0	0	0	0
LU24779-1	Circular	16	27	30	16	27	29	16	27	30
LU24779-2	Natural	0	0	0	0	0	0	0	0	0
LU24784-1	Circular	16	27	30	16	27	29	16	27	30
LU24784-2	Natural	0	0	0	0	0	0	0	0	0
LU24793-1	Circular	22	25	25	22	25	25	22	25	25
LU24793-2	Natural	0	-81	-132	0	-81	-130	0	-82	-130
LU24794-1	Circular	22	13	13	22	13	13	22	13	13
LU24794-2	Natural	5	132	228	3	129	223	4	131	222
LU24797-1	Circular	17	13	13	17	13	13	17	13	13
LU24797-2	Natural	12	73	197	11	73	196	11	73	198
LU24805-1	Circular	16	14	14	16	14	14	16	14	14
LU24805-2	Natural	11	71	194	10	71	193	11	71	195
LU24811-1	Circular	15	13	14	15	13	14	15	13	14
LU24811-2	Natural	19	79	200	18	79	200	19	79	201
LU24812-1	Circular	14	14	14	14	14	14	14	14	14
LU24812-2	Natural	23	83	206	22	84	205	23	84	206
LU24816-1	Circular	9	7	6	9	7	6	9	7	6
LU24816-2	Natural	7	14	32	7	14	33	7	16	30
LU24817-1	Circular	9	6	5	9	6	5	9	6	5
LU24817-2	Natural	8	17	28	8	17	29	8	17	28
LU24819-1	Circular	9	9	8	9	9	8	9	9	8
LU24819-2	Natural	2	14	31	2	14	31	2	14	31
LU24824-1	Circular	5	5	5	5	5	5	5	5	5
LU24824-2	Natural	6	17	32	6	17	32	6	17	32
LU24837-1	Circular	6	6	5	6	6	5	6	6	5
LU24837-2	Natural	6	17	32	6	17	32	6	17	32
LU24845-1	Circular	21	33	33	22	33	33	22	33	33
LU24845-2	Natural	0	0	0	0	0	0	0	0	0
LU24856-1	Circular	21	33	33	21	33	33	21	33	33
LU24856-2	Natural	0	0	0	0	0	0	0	0	0
LU24864-1	Circular	21	28	29	21	28	29	21	28	28
LU24864-2	Natural	0	-59	-105	0	-57	-103	0	-58	-102
LU24869-1	Circular	1	1	2	1	1	2	1	1	2
LU24869-2	Natural	0	0	0	0	0	0	0	0	0

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LU24871-1	Circular	9	7	8	9	7	8	9	8	8
LU24871-2	Natural	9	33	72	9	33	72	9	33	72
LU24874-1	Circular	1	3	3	1	3	3	1	3	3
LU24874-2	Natural	0	3	5	0	2	14	0	2	10
LU24875-1	Circular	9	8	10	9	7	10	9	8	8
LU24875-2	Natural	10	28	70	10	28	70	10	29	70
LU24876-1	Circular	12	11	11	12	11	11	12	11	11
LU24876-2	Natural	12	37	75	12	37	75	12	37	75
LU24878-1	Circular	8	6	5	8	6	5	8	6	5
LU24878-2	Natural	10	22	41	10	22	41	10	22	41
LU24884-1	Circular	2	2	2	2	2	2	2	2	2
LU24884-2	Natural	8	17	33	8	17	33	8	17	33
LU24885-1	Circular	8	7	7	8	7	7	8	7	7
LU24885-2	Natural	6	17	37	6	17	37	6	17	37
LU24889-1	Circular	9	7	7	9	7	7	9	7	7
LU24889-2	Natural	6	17	37	6	17	37	6	17	37
LU24890-1	Circular	1	1	2	1	1	2	1	1	2
LU24890-2	Natural	0	0	0	0	0	0	0	0	0
LU24891-1	Circular	2	2	2	2	2	2	2	2	2
LU24891-2	Natural	3	5	8	3	5	8	3	5	8
LU24897-1	Circular	3	3	3	3	3	3	3	3	3
LU24897-2	Natural	1	3	6	1	3	6	1	3	6
LU24901-1	Circular	3	3	3	3	3	3	3	3	3
LU24901-2	Natural	1	3	5	1	3	5	1	3	5
LU24901-3	Natural	2	5	9	2	5	9	2	5	9
LU24908-1	Circular	13	13	13	13	13	13	13	13	13
LU24908-2	Natural	3	31	83	3	31	82	3	31	82
LU24917	Circular	-5	-5	-5	-5	-5	-5	-5	-5	-5
LU24935-1	Circular	3	3	3	3	3	3	3	3	3
LU24935-2	Natural	23	50	98	23	50	98	23	50	98
LU24966	Circular	-5	-5	-5	-5	-5	-5	-5	-5	-5
LU24971-1	Circular	13	13	13	13	13	13	13	13	13
LU24971-2	Natural	0	27	74	0	27	74	0	27	74
LU24978-1	Circular	13	14	14	13	14	14	13	14	14
LU24978-2	Natural	0	22	71	0	22	71	0	23	71
LU24985-1	Circular	3	3	3	3	3	3	3	3	3
LU24985-2	Natural	21	46	92	21	46	92	21	46	92
LU24987-1	Circular	3	3	3	3	3	3	3	3	3
LU24987-2	Natural	0	-1	-7	0	-1	-7	0	-1	-7
LU24988-1	Circular	4	5	5	4	5	5	4	5	5
LU24988-2	Natural	0	4	11	0	4	11	0	4	11
LU25000-1	Circular	14	15	15	14	15	15	14	15	15
LU25000-2	Natural	1	30	84	1	30	84	1	30	84
LU25002-1	Circular	3	3	3	3	3	3	3	3	3
LU25002-2	Natural	1	6	13	1	6	13	1	6	13
LU25237-1	Circular	14	16	16	14	16	17	14	16	16
LU25237-2	Natural	0	26	80	0	26	80	0	26	79
LU25262	Circular	32	55	60	32	53	60	32	54	60
LU25273-1	Circular	25	32	33	25	32	33	25	32	33
LU25273-2	Natural	0	0	0	0	0	0	0	0	0
LU25286-1	Circular	25	32	33	25	32	33	25	32	33

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LU25286-2	Natural	0	0	0	0	0	0	0	0	0
LU25290-1	Circular	25	32	32	25	32	32	25	32	32
LU25290-2	Natural	0	0	2	0	0	2	0	0	2
LU25290-3	Natural	0	0	8	0	0	8	0	0	8
LU25296-1	Circular	21	22	23	21	22	23	21	22	23
LU25296-2	Natural	0	0	1	0	0	1	0	0	1
LU25299-1	Circular	21	22	24	21	22	24	21	22	24
LU25299-2	Natural	0	0	0	0	0	0	0	0	0
LU25301-3	Natural	0	0	0	0	0	0	0	0	0
LU25303-1	Circular	19	20	22	19	20	22	19	20	22
LU25303-2	Natural	0	0	5	0	0	5	0	0	5
LU25304-1	Circular	19	20	22	19	20	22	19	20	22
LU25304-2	Natural	0	0	5	0	0	5	0	0	5
LU25310-1	Circular	20	21	22	20	21	22	20	21	22
LU25310-2	Natural	0	0	4	0	0	4	0	0	4
LU25313-1	Circular	20	21	22	20	21	22	20	21	22
LU25313-2	Natural	0	0	0	0	0	0	0	0	0
LU25314-1	Circular	20	22	22	20	22	22	20	22	22
LU25314-2	Natural	0	0	1	0	0	1	0	0	1
LU25314-3	Natural	0	0	1	0	0	1	0	0	1
LU25315-1	Circular	15	18	18	15	18	18	15	18	18
LU25315-2	Natural	0	9	31	0	9	31	0	9	31
LU25316-1	Circular	18	19	20	18	19	20	18	19	21
LU25316-2	Natural	0	0	1	0	0	1	0	0	1
LU25327-1	Circular	15	18	18	15	18	18	15	18	18
LU25327-2	Natural	0	10	32	0	10	32	0	10	32
LU25327-3	Natural	0	18	55	0	18	55	0	18	55
LU25330-1	Circular	18	19	19	18	19	19	18	19	19
LU25330-2	Natural	0	3	14	0	3	14	0	3	14
LU25330-3	Natural	0	6	26	0	6	26	0	6	26
LU25333-1	Circular	18	19	20	18	19	20	18	19	20
LU25333-2	Natural	0	0	11	0	0	11	0	0	11
LU25347-1	Circular	18	19	19	18	19	19	18	19	19
LU25347-2	Natural	0	0	14	0	0	14	0	0	14
LU25374-1	Circular	3	3	3	3	3	3	3	3	3
LU25374-2	Natural	3	8	16	3	8	16	3	8	16
LU25377-1	Circular	3	3	3	3	3	3	3	3	3
LU25377-2	Natural	1	6	14	1	6	14	1	6	14
LU25379-1	Circular	3	4	3	3	4	3	3	4	3
LU25379-2	Natural	0	6	14	0	6	14	0	6	14
LU25385-1	Circular	4	4	4	4	4	4	4	4	4
LU25385-2	Natural	0	6	14	0	6	14	0	6	14
LU25390-1	Circular	3	3	3	3	3	3	3	3	3
LU25390-2	Natural	2	6	13	2	6	13	2	6	13
LU25390-3	Natural	3	8	17	3	8	17	3	8	17
LU25395-1	Circular	3	3	2	3	3	2	3	3	2
LU25395-2	Natural	3	8	16	3	8	16	3	8	16
LU25401-1	Circular	2	2	2	2	2	2	2	2	2
LU25401-2	Natural	13	44	96	13	44	95	13	44	96
LU25403-1	Circular	2	2	2	2	2	2	2	2	2
LU25403-2	Natural	6	11	22	6	11	22	6	11	23

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LU25405-1	Circular	2	2	2	2	2	2	2	2	2
LU25405-2	Natural	14	47	97	13	47	97	14	47	97
LU25410-1	Circular	2	2	2	2	2	2	2	2	2
LU25410-2	Natural	10	43	89	10	43	89	10	43	89
LU25437-1	Circular	6	6	7	6	6	7	6	6	7
LU25437-2	Natural	38	101	214	38	101	213	38	101	214
LU25490-1	Circular	2	2	2	2	2	2	2	2	2
LU25490-2	Natural	-4	-9	-14	-4	-9	-14	-4	-9	-14
LU25515-1	Circular	6	6	7	6	6	7	6	6	7
LU25515-2	Natural	38	100	213	38	100	213	39	100	213
LU25527-1	Circular	2	2	2	2	2	2	2	2	2
LU25527-2	Natural	0	0	0	0	0	0	0	0	0
LU25555-1	Circular	2	2	2	2	2	2	2	2	2
LU25555-2	Natural	0	0	0	0	0	0	0	0	0
LU25557-1	Circular	3	6	6	3	6	6	3	6	6
LU25557-2	Natural	0	0	5	0	0	5	0	0	5
LU25559-1	Circular	3	3	3	3	3	3	3	3	3
LU25559-2	Natural	10	9	-10	10	9	-10	10	9	-10
LU25560-1	Circular	7	7	8	7	7	8	7	7	8
LU25560-2	Natural	39	103	221	39	103	220	39	103	221
LU25857	Circular	81	96	90	81	95	89	82	96	90
LU25863	Circular	81	165	214	76	165	214	76	165	214
LU25880-1	Circular	74	82	77	75	81	78	77	80	78
LU25880-2	Natural	13	233	607	11	233	604	8	234	605
LU25888-1	Circular	71	70	67	71	70	67	71	70	68
LU25888-2	Natural	47	261	622	46	261	619	44	261	620
LU25890-1	Circular	75	78	75	75	77	75	77	78	75
LU25890-2	Natural	19	237	608	17	237	605	14	237	606
LU25893-1	Circular	73	73	70	74	73	70	76	73	70
LU25893-2	Natural	41	255	615	40	255	612	37	255	613
LU25895-1	Circular	66	64	63	66	63	64	66	64	64
LU25895-2	Natural	59	267	623	58	267	620	58	267	621
LU25921-1	Circular	58	61	61	58	61	61	58	60	61
LU25921-2	Natural	66	286	677	66	286	676	66	286	676
LU25934-1	Circular	50	49	52	46	51	52	51	51	52
LU25934-2	Natural	82	291	673	81	291	672	82	291	673
LU25936-1	Circular	54	56	56	54	56	56	54	56	56
LU25936-2	Natural	68	285	674	68	285	673	69	285	674
LU25948-1	Circular	45	49	50	45	46	50	44	45	50
LU25948-2	Natural	71	279	664	71	279	663	71	279	664
LU25955-1	Circular	44	42	41	44	41	41	44	41	41
LU25955-2	Natural	91	278	660	91	278	658	91	278	659
LU25957-1	Circular	40	38	40	40	38	40	40	38	39
LU25957-2	Natural	90	268	624	90	268	622	90	268	623
LU25965-1	Circular	39	37	36	39	37	36	39	37	36
LU25965-2	Natural	91	265	618	91	265	616	92	265	618
LU25967-1	Circular	33	33	33	33	33	33	33	33	34
LU25967-2	Natural	99	250	551	99	250	549	99	250	550
LU25972-1	Circular	34	33	33	34	33	33	33	33	33
LU25972-2	Natural	90	240	541	90	240	539	90	240	541
LU25973-1	Circular	34	33	33	34	33	33	34	33	33

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LU25973-2	Natural	87	236	538	87	236	536	87	236	538
LU25976-1	Circular	34	34	33	34	34	33	34	34	33
LU25976-2	Natural	96	246	548	96	246	546	96	246	547
LU25980-1	Circular	31	30	30	31	30	30	31	31	30
LU25980-2	Natural	81	203	455	81	203	454	81	203	455
LU25981-1	Circular	33	31	30	33	31	30	33	31	30
LU25981-2	Natural	77	199	450	77	199	448	77	199	450
LU25983-1	Circular	15	15	16	15	15	17	15	15	17
LU25983-2	Natural	58	153	342	58	153	341	58	153	342
LU25984-1	Circular	16	15	16	16	15	16	16	15	17
LU25984-2	Natural	60	155	345	60	155	344	60	155	345
LU25990-1	Circular	13	12	13	13	12	12	13	12	12
LU25990-2	Natural	55	133	288	55	133	288	55	133	289
LU25991-1	Circular	15	15	14	15	15	14	15	15	14
LU25991-2	Natural	58	151	336	58	151	335	58	151	336
LU25994-1	Circular	13	13	12	13	13	12	13	13	12
LU25994-2	Natural	52	130	284	52	130	283	52	130	284
LU25998-1	Circular	12	12	11	12	12	11	12	12	11
LU25998-2	Natural	49	127	280	49	127	279	49	127	280
LU25999-1	Circular	3	3	3	4	3	3	4	3	3
LU25999-2	Natural	10	11	22	10	11	21	10	11	22
LU26011-1	Circular	10	11	12	10	11	12	10	11	12
LU26011-2	Natural	0	0	12	0	0	12	0	0	12
LU26013-1	Circular	10	11	12	10	11	12	10	11	12
LU26013-2	Natural	0	0	12	0	0	12	0	0	12
LU26017-1	Circular	10	11	11	10	11	11	10	11	11
LU26017-2	Natural	0	6	18	0	6	18	0	6	18
LU26018-1	Circular	10	11	11	10	11	11	10	11	11
LU26018-2	Natural	0	1	14	0	1	14	0	1	14
LU26020-1	Circular	11	11	10	11	11	10	11	11	10
LU26020-2	Natural	2	9	20	2	9	20	2	9	20
LU26020-3	Natural	7	31	63	7	31	63	7	31	63
LU26022-1	Circular	7	7	7	7	7	7	7	7	7
LU26022-2	Natural	2	16	36	2	16	36	2	16	36
LU26024-1	Circular	6	6	6	6	6	6	6	6	6
LU26024-2	Natural	3	16	37	3	16	37	3	16	37
LU26029-1	Circular	5	6	5	5	6	5	5	6	5
LU26029-2	Natural	6	19	40	6	19	40	6	19	40
LU26067-1	Circular	15	15	13	15	14	13	15	14	13
LU26067-2	Natural	30	54	100	30	54	100	30	54	99
LU26106-1	Circular	4	4	4	4	4	4	4	4	4
LU26106-2	Natural	28	53	37	28	53	37	28	53	37
LU26125-1	Circular	15	15	13	15	15	13	15	15	13
LU26125-2	Natural	26	53	104	26	53	104	26	53	104
LU26127-1	Circular	3	3	3	3	3	3	3	3	3
LU26127-2	Natural	49	89	103	49	89	103	49	89	103
LU26132-1	Circular	15	15	13	15	15	13	15	15	13
LU26132-2	Natural	28	54	104	28	54	104	28	54	105
LU26165-1	Circular	15	15	13	15	15	13	15	15	13
LU26165-2	Natural	27	53	104	27	53	104	27	53	104
LU26167-1	Circular	15	15	13	15	15	14	15	15	14

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LU26167-2	Natural	30	56	107	30	56	107	30	56	107
LU26487-1	Circular	15	15	14	15	15	14	15	15	14
LU26487-2	Natural	27	53	105	27	53	105	27	53	105
LU26513-1	Circular	11	11	11	11	11	11	11	11	11
LU26513-2	Natural	0	6	18	0	6	18	0	6	18
LU26516-1	Circular	11	11	11	11	11	11	11	11	11
LU26516-2	Natural	0	5	18	0	5	18	0	5	18
LU26521-1	Circular	8	8	8	8	8	8	8	8	8
LU26521-2	Natural	12	24	53	12	24	53	12	24	53
LU26552-1	Circular	11	11	11	11	11	11	11	11	11
LU26552-2	Natural	4	13	27	4	13	27	4	13	27
LU26555-1	Circular	10	10	10	10	10	10	10	10	10
LU26555-2	Natural	6	14	29	6	14	29	6	14	29
LU26556-1	Circular	11	11	11	11	11	11	11	11	11
LU26556-2	Natural	4	13	28	4	13	28	4	13	28
LU26556-3	Natural	3	9	19	3	9	19	3	9	19
LU26558-1	Circular	9	9	9	9	9	9	9	9	9
LU26558-2	Natural	2	9	19	2	9	19	2	9	19
LU26560-1	Circular	10	11	11	10	11	11	10	11	10
LU26560-2	Natural	4	13	25	4	13	25	4	13	25
LU26560-3	Natural	17	48	89	17	48	89	17	48	89
LU26563-1	Circular	9	9	9	9	9	9	9	9	9
LU26563-2	Natural	3	10	20	3	10	20	3	10	20
LU26563-3	Natural	4	12	24	4	12	24	4	12	24
LU26565-1	Circular	7	7	7	7	7	7	7	7	7
LU26565-2	Natural	2	8	19	2	9	19	2	8	19
LU26570-1	Circular	7	7	7	7	7	7	7	7	7
LU26570-2	Natural	2	8	19	2	8	19	2	8	19
LU26570-3	Natural	2	7	15	2	7	15	2	7	15
LU26576-1	Circular	4	3	3	4	3	3	4	3	3
LU26576-2	Natural	4	8	14	4	8	14	4	8	14
LU26582-1	Circular	4	4	4	4	4	4	4	4	4
LU26582-2	Natural	2	7	13	2	7	13	2	7	13
LU26585-1	Circular	5	4	4	5	4	4	5	4	4
LU26585-2	Natural	2	7	13	2	7	13	2	7	13
LU26585-3	Natural	3	9	18	3	9	18	3	9	18
LU26629-1	Circular	3	5	5	3	5	5	3	5	5
LU26629-2	Natural	0	3	10	0	3	10	0	3	10
LU26652-1	Circular	7	7	7	7	7	7	7	7	7
LU26652-2	Natural	21	52	96	21	52	96	21	52	96
LU26697-1	Circular	6	6	6	6	6	6	6	6	6
LU26697-2	Natural	21	52	96	21	52	96	21	52	96
LU26704-1	Circular	2	3	2	2	3	2	2	3	2
LU26704-2	Natural	2	7	14	2	7	14	2	7	14
LU26705-1	Circular	3	3	3	3	3	3	3	3	3
LU26705-2	Natural	1	7	14	1	7	14	1	7	14
LU26724-1	Circular	6	6	6	6	6	6	6	6	6
LU26724-2	Natural	23	54	98	23	54	98	23	54	98
LU26732-1	Circular	6	6	6	6	6	6	6	6	6
LU26732-2	Natural	24	56	99	24	56	99	24	56	99
LU26739-1	Circular	5	5	5	5	5	5	5	5	5

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LU26739-2	Natural	24	56	99	24	56	99	24	56	99
LU26773-1	Circular	5	5	5	5	5	5	5	5	5
LU26773-2	Natural	23	55	98	23	55	99	23	55	98
LU27025-1	Circular	5	5	5	5	5	5	5	5	5
LU27025-2	Natural	25	57	101	25	57	101	25	57	101
LU27166-1	Circular	6	6	6	6	6	6	6	6	6
LU27166-2	Natural	13	37	68	13	37	68	13	37	68
LU27229-1	Circular	6	6	6	6	6	6	6	6	6
LU27229-2	Natural	14	38	69	14	38	69	14	38	69
LU27349-1	Circular	5	5	5	5	5	5	5	5	5
LU27349-2	Natural	10	27	49	10	27	49	10	27	49
LU27399-1	Circular	4	4	4	4	4	4	4	4	4
LU27399-2	Natural	10	27	50	10	27	50	10	27	50
LU27437-1	Circular	4	4	4	4	4	4	4	4	4
LU27437-2	Natural	3	13	27	3	13	27	3	13	27
LU27577-1	Circular	4	4	4	4	4	4	4	4	4
LU27577-2	Natural	0	0	0	0	0	0	0	0	0
LU27583-1	Circular	4	4	4	4	4	4	4	4	4
LU27583-2	Natural	0	0	0	0	0	0	0	0	0
LU27793-1	Circular	6	6	6	6	6	6	6	6	6
LU27793-2	Natural	3	13	25	3	13	25	3	13	25
LU99999-1	Circular	16	21	21	16	21	21	16	21	21
LU99999-2	Natural	0	-69	-129	0	-70	-123	0	-68	-123
LV13912-1.	Circular	1	2	1	1	2	1	1	2	1
LV13912-2.	Natural	0	1	4	0	1	4	0	1	4
LV13967-1.	Circular	2	2	2	2	2	2	2	2	2
LV13967-2.	Natural	-2	-10	-19	-2	-10	-19	-2	-10	-19
LV13972-1.	Circular	2	2	2	2	2	2	2	2	2
LV13972-2.	Natural	1	7	15	1	6	15	1	6	15
LV13973-1.	Circular	3	3	2	3	3	2	3	3	2
LV13973-2.	Natural	1	6	15	1	6	15	1	6	15
LV14497-1.	Circular	8	7	7	7	7	7	7	7	7
LV14497-2	Natural	0	23	71	0	23	71	0	23	71
LV14497-2.	Natural	19	28	31	19	28	31	19	28	31
LV14500-1.	Circular	-4	-4	-3	-4	-4	-3	-4	-4	-3
LV14500-2.	Natural	1	6	10	1	6	10	1	6	10
LV14521-1.	Circular	4	3	3	4	3	3	4	3	3
LV14521-2.	Natural	0	4	19	0	4	19	0	4	19
LV14593-1	Circular	4	3	3	4	3	3	4	3	3
LV14593-2	Natural	0	3	17	0	3	17	0	3	17
LV14594-1.	Circular	7	7	7	7	7	7	7	7	7
LV14594-2.	Natural	9	12	18	9	12	18	9	12	18
LV14618-1	Circular	4	3	3	4	3	3	4	3	3
LV14618-2	Natural	0	-1	-5	0	-1	-5	0	-1	-5
LV14625-1	Circular	2	1	1	2	1	1	2	1	1
LV14625-2	Natural	3	6	12	3	6	12	3	6	12
LV14709-1	Circular	4	3	3	4	4	3	4	3	3
LV14709-2	Natural	0	3	17	0	3	17	0	3	17
LV14718-1	Circular	8	7	-8	8	7	-8	8	7	-8
LV14718-2	Natural	0	0	2	0	0	2	0	0	2
LV14721-1	Circular	2	2	2	2	2	2	2	2	2

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LV14721-2	Natural	2	5	11	2	5	11	2	5	11
LV14722-1	Circular	4	3	3	4	3	3	4	3	3
LV14722-2	Natural	0	0	0	0	0	0	0	0	0
LV14958-1	Circular	4	3	3	4	3	3	4	3	3
LV14958-2	Natural	0	0	0	0	0	0	0	0	0
LV14976-1	Circular	4	4	3	4	4	3	4	4	3
LV14976-2	Natural	-1	5	20	-1	5	20	-1	5	20
LV15129-1	Circular	4	4	4	4	4	4	4	4	4
LV15129-2	Natural	0	0	0	0	0	0	0	0	0
LV15133-1	Circular	6	6	6	6	6	6	6	6	6
LV15133-2	Natural	12	24	42	12	24	42	12	24	42
LV15134-1	Circular	4	4	4	4	4	4	4	4	4
LV15134-2	Natural	10	18	31	10	18	31	10	18	31
LV15135-1	Circular	2	2	1	2	2	1	2	2	1
LV15135-2	Natural	0	0	0	0	0	0	0	0	0
LV15137-1	Circular	4	4	4	4	4	4	4	4	4
LV15137-2	Natural	0	0	2	0	0	2	0	0	2
LV15138-1	Circular	5	5	5	5	5	5	5	5	5
LV15138-2	Natural	13	25	43	13	25	43	13	25	43
LV15144-1	Circular	2	2	1	2	2	1	2	2	1
LV15144-2	Natural	0	0	0	0	0	0	0	0	0
LV15144-3	Natural	0	2	4	0	2	4	0	2	4
LV15177-1	Circular	10	9	12	10	9	12	10	9	12
LV15177-2	Natural	0	0	1	0	0	1	0	0	1
LV15177-3	Natural	0	0	2	0	0	2	0	0	2
LV15211-1	Circular	16	15	15	16	15	15	16	15	15
LV15211-2	Natural	8	31	76	8	31	76	8	31	76
LV15325-1	Circular	16	14	15	16	14	15	16	14	15
LV15325-2	Natural	7	31	75	7	31	75	7	31	76
LV15330-1	Circular	10	9	9	10	9	9	10	9	9
LV15330-2	Natural	0	0	4	0	0	4	0	0	4
LV15388-1	Circular	2	2	2	2	2	2	2	2	2
LV15388-2	Natural	0	-5	-11	0	-5	-11	0	-5	-11
LV15403-1	Circular	10	9	8	10	9	8	10	9	8
LV15403-2	Natural	1	4	10	1	4	10	1	4	10
LV15405-1	Circular	16	14	15	17	14	15	17	14	15
LV15405-2	Natural	6	31	76	6	31	76	6	31	76
LV15479-1	Circular	2	2	2	2	2	2	2	2	2
LV15479-2	Natural	0	3	10	0	3	10	0	3	10
LV15737-1	Circular	18	14	15	18	14	15	18	14	15
LV15737-2	Natural	4	37	82	4	37	82	4	37	82
LV15855-1	Circular	19	14	15	19	14	15	19	14	15
LV15855-2	Natural	0	34	80	0	34	80	0	34	80
LV15871-1	Circular	14	13	11	14	13	11	14	13	11
LV15871-2	Natural	0	0	4	0	0	4	0	0	4
LV15871-3	Natural	6	26	56	6	26	56	6	26	56
LV15873-1	Circular	0	0	0	0	0	0	0	0	0
LV15873-2	Natural	0	0	0	0	0	0	0	0	0
LV15874-1	Circular	0	0	0	0	0	0	0	0	0
LV15874-2	Natural	0	0	0	0	0	0	0	0	0
LV15876-1	Circular	0	0	0	0	0	0	0	0	0

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LV15876-2	Natural	0	0	0	0	0	0	0	0	0
LV15877-1	Circular	0	0	0	0	0	0	0	0	0
LV15877-2	Natural	0	0	0	0	0	0	0	0	0
LV15881-1	Circular	0	0	0	0	0	0	0	0	0
LV15881-2	Natural	0	0	0	0	0	0	0	0	0
LV15882-1	Circular	14	13	11	14	13	11	14	13	11
LV15882-2	Natural	0	0	0	0	0	0	0	0	0
LV15884-1	Circular	14	13	11	14	13	11	14	13	11
LV15884-2	Natural	0	0	1	0	0	1	0	0	1
LV15885-1	Circular	15	15	14	15	15	14	15	15	14
LV15885-2	Natural	0	0	1	0	0	1	0	0	1
LV15887-1	Circular	16	16	15	17	16	15	17	16	15
LV15887-2	Natural	0	0	10	0	0	10	0	0	10
LV15888-1	Circular	17	15	15	17	15	15	17	15	15
LV15888-2	Natural	0	4	15	0	4	15	0	4	15
LV15889-1	Circular	21	21	19	21	21	19	21	21	19
LV15889-2	Natural	0	5	26	0	5	26	0	5	26
LV15890-1	Circular	21	20	19	21	20	19	21	20	19
LV15890-2	Natural	0	6	28	0	6	28	0	6	28
LV15892-1	Circular	5	-5	8	5	-5	8	5	-5	8
LV15892-2	Natural	0	-16	-58	0	-16	-58	0	-16	-58
LV15893-1	Circular	5	-5	8	5	-5	8	5	-5	8
LV15893-2	Natural	0	15	-150	0	15	-151	0	15	-154
LV15894-1	Circular	5	-6	8	5	-6	8	5	-6	8
LV15894-2	Natural	0	14	56	0	14	56	0	14	56
LV15897-1	Circular	0	0	0	0	0	0	0	0	0
LV15897-2	Natural	0	0	0	0	0	0	0	0	0
LV15898-1	Circular	5	4	6	5	4	6	5	4	6
LV15898-2	Natural	-5	-18	247	-5	-18	245	-5	-18	231
LV15898-3	Natural	11	47	550	11	47	511	11	47	555
LV15900-1	Circular	29	29	23	29	29	23	29	29	23
LV15900-2	Natural	17	54	96	17	53	99	17	54	96
LV15943-1	Circular	42	41	38	42	41	38	42	41	38
LV15943-2	Natural	0	14	45	0	14	45	0	14	45
LV16006-1	Circular	4	3	3	4	3	3	4	3	3
LV16006-2	Natural	3	6	14	3	6	14	3	6	14
LV16025-1	Circular	29	33	28	29	33	28	29	33	28
LV16025-2	Natural	0	0	-51	0	0	-50	0	0	-51
LV16087-1	Circular	3	3	3	3	3	3	3	3	3
LV16087-2	Natural	5	10	17	5	10	17	5	10	17
LV16089-1	Circular	42	41	38	42	41	38	42	41	38
LV16089-2	Natural	0	17	50	0	17	50	0	17	50
LV16106-1	Circular	27	33	49	27	33	47	27	33	48
LV16106-2	Natural	0	0	0	0	0	0	0	0	0
LV16136-1	Circular	42	40	38	42	40	38	42	40	38
LV16136-2	Natural	0	22	57	0	22	57	0	22	57
LV16160-1	Circular	3	3	3	3	3	3	3	3	3
LV16160-2	Natural	0	0	61	0	0	61	0	0	61
LV16461-1	Circular	26	33	45	26	33	46	26	33	48
LV16461-2	Natural	0	0	0	0	0	0	0	0	0
LV16485-1	Circular	42	40	38	42	39	38	42	39	38

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LV16485-2	Natural	0	35	67	0	35	67	0	35	67
LV16562-1	Circular	4	5	5	4	5	5	4	5	6
LV16562-2	Natural	0	1	6	0	1	6	0	1	6
LV16563-1	Circular	4	4	4	4	4	4	4	4	4
LV16563-2	Natural	2	8	16	2	8	16	2	8	16
LV16564-1	Circular	4	4	6	4	4	6	4	4	6
LV16564-2	Natural	0	3	9	0	3	9	0	3	9
LV16565-1	Circular	12	12	11	12	12	11	12	11	11
LV16565-2	Natural	8	22	47	8	22	47	8	22	47
LV16566-1	Circular	12	11	10	12	11	10	12	11	10
LV16566-2	Natural	4	18	43	4	18	43	4	18	43
LV16567-1	Circular	12	11	10	12	11	10	12	11	10
LV16567-2	Natural	4	19	44	4	19	43	4	19	44
LV16568-1	Circular	20	19	17	20	19	17	20	19	17
LV16568-2	Natural	2	33	77	2	33	77	2	33	77
LV16569-1	Circular	20	19	16	20	19	16	20	19	16
LV16569-2	Natural	0	27	73	0	27	73	0	27	73
LV16571-1	Circular	86	100	113	86	100	113	86	100	113
LV16571-2	Natural	0	0	90	0	0	89	0	0	90
LV16572-1	Circular	127	137	144	127	137	144	127	137	144
LV16572-2	Natural	0	0	0	0	0	0	0	0	0
LV16573-1	Circular	20	25	16	20	25	16	20	25	16
LV16573-2	Natural	0	31	70	0	31	70	0	31	70
LV16574-1	Circular	85	92	91	85	92	91	85	92	91
LV16574-2	Natural	0	-10	-129	0	-10	-129	0	-10	-129
LV16575-1	Circular	118	127	140	118	127	139	118	127	140
LV16575-2	Natural	0	0	0	0	0	0	0	0	0
LV16577-1	Circular	0	0	0	0	0	0	0	0	0
LV16578-1	Circular	72	74	62	72	74	62	72	74	62
LV16578-2	Natural	0	63	154	0	63	154	0	63	154
LV16582-1	Circular	120	127	140	120	127	139	120	127	140
LV16582-2	Natural	0	0	0	0	0	0	0	0	0
LV16583-1	Circular	94	98	106	94	98	106	94	98	107
LV16583-2	Natural	0	0	27	0	0	28	0	0	29
LV16583-3	Natural	0	0	-91	0	0	-91	0	0	-72
LV16584-1	Circular	92	97	110	92	97	110	92	97	110
LV16584-2	Natural	0	0	0	0	0	0	0	0	0
LV16587-1	Circular	84	86	75	84	85	75	84	85	75
LV16587-2	Natural	0	54	164	0	54	163	0	54	163
LV16588-1	Circular	92	99	110	92	99	110	92	99	110
LV16588-2	Natural	0	0	0	0	0	0	0	0	0
LV16589-1	Circular	89	91	90	89	91	89	89	91	91
LV16589-2	Natural	0	24	110	0	24	110	0	24	113
LV16589-3	Natural	0	21	134	0	21	132	0	21	129
LV16590-1	Circular	84	84	85	83	84	86	83	83	86
LV16590-2	Natural	0	31	115	0	31	115	0	31	104
LV16591-1	Circular	88	89	99	88	89	99	88	89	99
LV16591-2	Natural	0	0	-43	0	0	-43	0	0	-44
LV16649-1	Circular	117	118	116	117	116	116	117	116	116
LV16649-2	Natural	0	0	0	0	0	0	0	0	0
LV16687-1	Circular	15	13	13	15	13	13	15	13	13

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LV16687-2	Natural	1	21	48	1	21	48	1	21	48
LV16693-1	Circular	3	3	4	3	3	4	3	3	4
LV16693-2	Natural	0	1	4	0	1	4	0	1	4
LV16701-1	Circular	12	11	11	12	11	11	12	11	11
LV16701-2	Natural	0	0	0	0	0	0	0	0	0
LV16722-1	Circular	3	3	4	3	3	4	3	3	4
LV16722-2	Natural	0	1	4	0	1	4	0	1	4
LV16730-1	Circular	14	13	13	14	13	13	14	13	13
LV16730-2	Natural	5	21	46	5	21	46	5	21	46
LV16731-1	Circular	3	3	3	3	3	3	3	3	3
LV16731-2	Natural	0	1	4	0	1	4	0	1	4
LV16738-1	Circular	12	11	11	12	11	11	12	11	11
LV16738-2	Natural	0	0	0	0	0	0	0	0	0
LV1682	Circular	3	11	16	3	11	16	3	11	16
LV16975-1	Circular	3	3	3	3	3	3	3	3	3
LV16975-2	Natural	0	1	4	0	1	4	0	1	4
LV16975-3	Natural	1	7	19	1	7	19	1	7	19
LV17039-1	Circular	12	11	11	12	11	11	12	11	11
LV17039-2	Natural	0	0	0	0	0	0	0	0	0
LV17049-1	Circular	15	13	13	15	13	13	15	13	13
LV17049-2	Natural	6	21	47	6	21	47	6	21	47
LV17077-1	Circular	117	132	116	117	124	115	117	131	118
LV17077-2	Natural	0	3	21	0	3	21	0	3	21
LV17147-1	Circular	12	11	11	12	11	11	12	11	11
LV17147-2	Natural	4	7	5	4	7	6	4	7	6
LV17147-3	Natural	9	31	62	9	31	62	9	31	62
LV17149-1	Circular	10	11	10	10	11	10	10	12	10
LV17149-2	Natural	0	0	5	0	0	5	0	0	5
LV17150-1	Circular	10	12	10	10	12	10	10	12	10
LV17150-2	Natural	0	1	6	0	1	6	0	1	6
LV17150-3	Natural	0	1	8	0	1	8	0	1	8
LV17151-1	Circular	11	11	7	10	10	7	10	10	7
LV17151-2	Natural	0	8	13	0	8	13	0	8	13
LV17153-1	Circular	5	5	5	5	5	5	5	5	5
LV17153-2	Natural	0	4	13	0	4	13	0	4	13
LV17154-1	Circular	2	2	2	2	2	2	2	2	2
LV17154-2	Natural	3	8	16	3	8	16	3	8	16
LV17170-1	Circular	3	3	3	3	3	3	3	3	3
LV17170-2	Natural	1	3	6	1	3	6	1	3	6
LV17170-3	Natural	1	4	8	1	4	8	1	4	8
LV17173-1	Circular	3	3	3	3	3	3	3	3	3
LV17173-2	Natural	1	3	6	1	3	6	1	3	6
LV17178-1	Circular	4	4	3	4	4	3	4	4	3
LV17178-2	Natural	1	4	8	1	4	8	1	4	8
LV17180-1	Circular	4	4	4	4	4	4	4	4	4
LV17180-2	Natural	2	4	8	2	4	8	2	4	8
LV17182-1	Circular	4	4	4	4	4	4	4	4	4
LV17182-2	Natural	2	4	8	2	4	8	2	4	8
LV17182-3	Natural	3	7	15	3	7	15	3	7	15
LV17210-1	Circular	4	-3	5	4	-3	5	4	-3	5
LV17210-2	Natural	2	4	5	2	4	5	2	4	5

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LV17218-1	Special	141	158	141	141	160	141	141	159	141
LV17218-2	Natural	0	48	145	0	48	144	0	47	145
LV17219-1	Circular	7	7	7	7	7	7	7	7	7
LV17219-2	Natural	6	13	24	6	13	24	6	13	24
LV17275-1	Circular	4	4	5	4	4	5	4	4	5
LV17275-2	Natural	0	0	0	0	0	0	0	0	0
LV17285-1	Circular	5	4	4	5	4	4	5	4	4
LV17285-2	Natural	1	2	3	1	2	3	1	2	3
LV17295-1	Circular	3	3	3	3	3	3	3	3	3
LV17295-2	Natural	-1	-4	-13	-1	-4	-13	-1	-4	-13
LV17334-1	Circular	4	4	5	4	4	5	4	4	5
LV17334-2	Natural	0	0	0	0	0	0	0	0	0
LV17346-1	Special	139	138	132	139	137	132	139	138	132
LV17346-2	Natural	0	-123	-176	0	-123	-176	0	-123	-176
LV17353-1	Circular	5	4	4	5	4	4	5	4	4
LV17353-2	Natural	1	2	3	1	2	3	1	2	3
LV17354-1	Circular	2	2	2	2	2	2	2	2	2
LV17354-2	Natural	-1	-7	16	-1	-7	17	-1	-7	17
LV17538-1	Circular	5	4	4	5	4	4	5	4	4
LV17538-2	Natural	1	2	3	1	2	3	1	2	3
LV17647-1	Circular	139	149	130	139	149	130	139	149	130
LV17647-2	Natural	0	0	-116	0	0	-116	0	0	-116
LV17785-1	Circular	5	4	4	5	4	4	5	4	4
LV17785-2	Natural	2	3	4	2	3	4	2	3	4
LV17785-3	Natural	7	11	16	7	11	16	7	11	16
LV17803-1	Circular	4	4	5	4	4	5	4	4	5
LV17803-2	Natural	0	0	0	0	0	0	0	0	0
LV17827-1	Circular	3	5	6	3	5	6	3	5	6
LV17827-2	Natural	0	0	1	0	0	1	0	0	1
LV17827-3	Natural	0	0	2	0	0	2	0	0	2
LV17828-1	Circular	6	11	16	6	11	16	6	11	16
LV17828-2	Natural	0	0	0	0	0	0	0	0	0
LV17830-1	Circular	3	5	6	3	5	6	3	5	6
LV17830-2	Natural	0	0	0	0	0	0	0	0	0
LV17831-1	Circular	25	28	22	25	28	22	25	28	22
LV17831-2	Natural	-2	-46	-89	-2	-46	-90	-2	-46	-90
LV17832-1	Circular	25	23	22	25	23	22	25	23	22
LV17832-2	Natural	0	-26	-75	0	-26	-75	0	-26	-75
LV17833-1	Circular	3	5	6	3	5	6	3	5	6
LV17833-2	Natural	0	0	0	0	0	0	0	0	0
LV17835-1	Circular	24	25	22	24	25	22	24	24	22
LV17835-2	Natural	0	3	22	0	3	22	0	3	22
LV17839-1	Circular	24	27	24	24	27	24	24	27	24
LV17839-2	Natural	0	0	21	0	0	21	0	0	21
LV17840-1	Circular	28	33	38	29	33	38	29	33	38
LV17840-2	Natural	0	0	41	0	0	41	0	0	41
LV17841-1	Circular	51	59	42	51	59	42	51	59	42
LV17841-2	Natural	0	0	-39	0	0	-40	0	0	-43
LV17842-1	Circular	51	52	42	51	52	42	51	52	42
LV17842-2	Natural	0	-39	46	0	-39	45	0	-39	46
LV17843-1	Circular	49	51	41	49	51	41	49	51	41

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LV17843-2	Natural	0	-37	-36	0	-37	-40	0	-37	-36
LV17846-1	Circular	49	51	41	49	51	41	49	51	41
LV17846-2	Natural	-19	-45	-53	-19	-45	-53	-19	-45	-53
LV17863-1	Circular	2	2	2	2	2	2	2	2	2
LV17863-2	Natural	0	0	0	0	0	0	0	0	0
LV17863-3	Natural	0	2	5	1	2	5	0	2	5
LV17866-1	Circular	2	2	2	2	2	2	2	2	2
LV17866-2	Natural	0	0	0	0	0	0	0	0	0
LV17868-1	Circular	2	3	4	2	3	4	2	3	4
LV17868-2	Natural	0	0	0	0	0	0	0	0	0
LV17869-1	Circular	2	3	3	2	3	3	2	3	3
LV17869-2	Natural	0	0	2	0	0	2	0	0	2
LV17870-1	Circular	2	3	3	2	3	3	2	3	3
LV17870-2	Natural	0	0	-6	0	0	-6	0	0	-6
LV17872-1	Circular	4	5	5	4	5	5	4	5	5
LV17872-2	Natural	0	1	8	0	1	8	0	1	8
LV17874-1	Circular	4	5	5	4	5	5	4	5	5
LV17874-2	Natural	1	4	10	1	3	10	1	3	10
LV17875-1	Circular	7	8	7	7	8	7	7	8	7
LV17875-2	Natural	0	2	6	0	2	6	0	2	6
LV17875-3	Natural	0	4	14	0	4	14	0	4	14
LV17876-1	Circular	7	7	8	7	7	8	7	7	8
LV17876-2	Natural	0	0	0	0	0	0	0	0	0
LV17878-1	Circular	7	7	8	7	7	8	7	7	8
LV17878-2	Natural	0	0	0	0	0	0	0	0	0
LV17880-1	Circular	7	8	8	7	8	8	7	8	8
LV17880-2	Natural	0	0	3	0	0	3	0	0	3
LV17883-1	Circular	4	5	5	4	5	5	4	5	5
LV17883-2	Natural	0	3	9	0	3	9	0	3	9
LV17884-1	Circular	4	4	4	4	4	4	4	4	4
LV17884-2	Natural	1	5	12	1	5	12	1	5	12
LV17885-1	Circular	4	5	5	4	5	5	4	5	5
LV17885-2	Natural	0	4	11	0	4	11	0	4	11
LV17922-1	Circular	3	4	4	3	4	4	3	4	4
LV17922-2	Natural	0	7	45	0	7	45	0	7	45
LV17947-1	Circular	184	198	178	184	198	178	184	198	178
LV17947-2	Natural	0	0	0	0	0	0	0	0	0
LV17958-1	Circular	3	4	2	3	4	2	3	4	2
LV17958-2	Natural	0	7	47	0	7	47	0	7	47
LV17977-1	Circular	5	5	4	5	5	4	5	5	4
LV17977-2	Natural	4	10	18	4	10	18	4	10	18
LV17982-1	Circular	5	5	5	5	5	5	5	5	5
LV17982-2	Natural	0	7	15	0	7	15	0	7	15
LV17983-1	Circular	5	5	5	5	5	5	5	5	5
LV17983-2	Natural	0	7	16	0	7	16	0	7	16
LV17984-1	Circular	181	198	173	181	198	173	181	198	173
LV17984-2	Natural	0	0	0	0	0	0	0	0	0
LV18228-1	Circular	181	199	170	181	199	169	181	199	170
LV18228-2	Natural	0	0	0	0	0	0	0	0	0
LV18248-1	Circular	12	13	13	12	13	13	12	13	13
LV18248-2	Natural	0	11	29	0	11	29	0	11	29

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LV18261-1	Circular	5	13	13	5	13	13	5	13	13
LV18261-2	Natural	0	7	19	0	7	19	0	7	19
LV18538-1	Circular	6	8	7	6	8	7	6	8	8
LV18538-2	Natural	0	4	11	0	4	11	0	4	11
LV18539-1	Circular	17	23	26	17	23	26	17	23	25
LV18539-2	Natural	0	8	32	0	8	32	0	8	32
LV18545-1	Circular	30	41	57	30	41	57	30	41	57
LV18545-2	Natural	0	0	8	0	0	8	0	0	8
LV18546-1	Circular	33	48	67	33	48	67	33	48	67
LV18546-2	Natural	0	0	0	0	0	0	0	0	0
LV18547-1	Circular	30	41	48	30	41	48	30	41	48
LV18547-2	Natural	0	0	30	0	0	30	0	0	30
LV18547-3	Natural	0	0	30	0	0	30	0	0	30
LV18548-1	Circular	30	41	60	30	41	60	30	41	60
LV18548-2	Natural	0	0	0	0	0	0	0	0	0
LV18548-3	Natural	0	0	0	0	0	0	0	0	0
LV18549-1	Circular	27	36	35	27	36	35	27	36	35
LV18549-2	Natural	0	0	56	0	0	55	0	0	56
LV18550-1	Circular	29	38	40	29	38	40	29	38	40
LV18550-2	Natural	0	0	54	0	0	53	0	0	54
LV18551-1	Circular	27	35	40	27	35	40	27	35	40
LV18551-2	Natural	0	14	67	0	14	67	0	14	67
LV18570-1	Circular	213	227	240	213	227	240	213	227	240
LV18570-2	Natural	0	0	0	0	0	0	0	0	0
LV18612-1	Circular	6	10	9	6	10	9	6	10	9
LV18612-2	Natural	0	-7	-14	0	-7	-14	0	-7	-14
LV18645-1	Circular	17	20	20	17	20	20	17	20	20
LV18645-2	Natural	0	5	31	0	5	31	0	5	31
LV19138-1	Circular	212	228	243	212	228	243	212	228	243
LV19138-2	Natural	0	0	0	0	0	0	0	0	0
LV19728-1	Circular	224	266	313	224	266	313	223	266	313
LV19728-2	Natural	0	0	0	0	0	0	0	0	0
LV19898-1	Circular	224	266	313	224	266	313	224	266	313
LV19898-2	Natural	0	0	775	0	0	686	0	0	695
LV19981	Circular	269	316	363	269	316	363	269	316	364
LV20671-1	Circular	31	31	31	31	31	31	31	31	31
LV20671-2	Natural	3	-105	246	3	-98	251	3	-175	248
LV20772-1	Circular	34	49	49	34	49	49	34	49	49
LV20772-2	Natural	0	23	97	0	23	97	0	23	97
LV21321-1	Circular	5	11	11	5	11	11	5	11	11
LV21321-2	Natural	0	0	7	0	0	7	0	0	7
LV21430-1	Circular	16	25	24	16	25	24	16	25	24
LV21430-2	Natural	0	8	41	0	8	41	0	8	41
LV21913-1	Circular	17	24	23	17	24	23	17	24	23
LV21913-2	Natural	0	16	50	0	16	50	0	16	50
LV22048-1	Circular	10	14	13	10	14	13	10	14	13
LV22048-2	Natural	0	13	32	0	13	32	0	13	32
LV22050-1	Circular	11	15	13	11	15	13	11	15	13
LV22050-2	Natural	0	9	28	0	9	28	0	9	28
LV22056-1	Circular	10	14	13	10	14	13	10	14	13
LV22056-2	Natural	0	9	27	0	9	27	0	9	27

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
LV99999-1	Circular	45	52	44	45	52	44	45	52	44
LV99999-2	Natural	16	121	692	16	120	706	16	135	681
LVWEIR	Circular	8	29	47	8	29	47	8	29	47
OVFL10	Natural	5	8	12	5	8	12	5	8	12
OVFL11	Natural	5	8	12	5	8	12	5	8	12
OVFL12	Natural	0	0	-1	0	0	-1	0	0	-1
OVFL13	Natural	0	0	-1	0	0	-1	0	0	-1
OVFL14	Natural	0	0	-1	0	0	-1	0	0	-1
OVFL4	Natural	2	3	6	2	3	6	2	3	6
OVFL5	Natural	2	3	6	2	3	6	2	3	6
OVFL6	Natural	11	17	24	11	17	24	11	17	24
OVFL7	Natural	11	17	24	11	17	24	11	17	24
Prt-24-25.	Natural	1	8	22	1	7	22	1	8	22
Prt-27-28.	Natural	0	6	15	0	6	15	0	6	15
Prt-28-29.	Natural	0	3	6	0	3	6	0	3	6
Pump 1	Circular	0	0	0	0	0	0	0	0	0
RLS-1	Circular	0	0	0	0	0	0	0	0	0
RLS-2	Circular	0	0	0	0	0	0	0	0	0
ST \46_PO	Natural	16	48	104	16	48	104	16	48	104
ST 4_44	Natural	1	4	8	1	4	8	1	4	8
ST 4_PO	Natural	4	18	37	3	17	37	3	17	37
ST 42_PL	Natural	0	0	0	0	0	0	0	0	0
ST 43_3	Natural	0	0	5	0	0	5	0	0	5
ST 43_4	Natural	0	0	0	0	0	0	0	0	0
ST 43_5	Natural	0	0	0	0	0	0	0	0	0
ST 43_CL	Natural	0	0	-3	0	0	-3	0	0	-3
ST 43_PO	Natural	0	0	0	0	0	0	0	0	0
ST 44_2	Natural	0	0	0	0	0	0	0	0	0
ST 44_3	Natural	4	18	52	4	18	52	4	18	52
ST 44_3A	Natural	0	11	45	0	11	45	0	11	45
ST 44_4	Natural	2	10	42	2	10	42	2	10	42
ST 44_4A	Natural	4	15	49	4	15	49	4	15	49
ST 44_5	Natural	9	19	33	9	18	33	8	18	33
ST 44_5 B	Natural	8	18	42	8	17	42	8	17	42
ST 44_5A	Natural	0	0	0	0	0	0	0	0	0
ST 44_CL	Natural	1	6	34	1	6	34	1	6	34
ST 44_PO	Natural	21	47	91	21	46	91	21	46	91
ST 44_POA	Natural	43	86	149	43	82	149	43	82	149
ST 44_WE	Natural	-3	9	-9	-3	9	9	-3	9	9
ST 44CL_M	Natural	1	6	34	1	6	34	1	6	34
ST 45_2	Natural	0	0	0	0	0	0	0	0	0
ST 45_3	Natural	1	1	0	5	7	0	1	8	0
ST 45_3A	Natural	7	8	0	7	8	0	3	8	0
ST 45_3B	Natural	0	1	0	0	1	0	0	2	0
ST 45_3C	Natural	0	1	0	1	1	1	0	1	0
ST 45_3M	Natural	1	2	4	1	2	4	1	2	4
ST 45_4	Natural	0	1	0	0	0	0	0	0	0
ST 45_5	Natural	0	1	0	0	0	0	0	0	0
ST 45_CL	Natural	1	6	-7	2	4	-7	1	3	-7
ST 45_CLA	Natural	0	1	0	0	0	0	0	0	0
ST 45_PL	Natural	0	0	0	0	0	0	0	0	0

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
ST 45_PL2	Natural	0	0	0	0	0	0	0	0	0
ST 45_PO	Natural	0	0	0	0	0	0	0	0	0
ST 46_2A	Natural	0	0	0	0	0	0	0	0	0
ST 46_2M	Natural	0	0	0	0	0	0	0	0	0
ST 46_3	Natural	0	5	31	0	5	31	0	5	31
ST 46_3A	Natural	0	4	42	0	4	42	0	5	42
ST 46_4	Natural	0	1	48	0	1	49	0	1	48
ST 46_4A	Natural	0	0	43	0	0	44	0	0	42
ST 46_4B	Natural	0	1	50	0	1	51	0	1	49
ST 46_5	Natural	6	17	22	6	17	22	6	17	22
ST 46_5A	Natural	0	0	0	0	0	0	0	0	0
ST 46_CL	Natural	17	23	49	16	21	49	17	21	49
ST 46_CLA	Natural	0	-10	-43	0	-9	-43	0	-9	-43
ST 46_LY	Natural	1	4	11	1	4	11	1	4	11
ST 46_M	Natural	0	0	19	0	0	19	0	0	19
ST 46_MA	Natural	0	0	0	0	0	0	0	0	0
ST 46_PO	Natural	6	30	74	6	31	74	6	31	74
ST 46_POA	Natural	-2	-16	-43	-2	-16	-43	-2	-16	-43
ST 47_2	Natural	0	0	0	0	0	0	0	0	0
ST 47_3	Natural	0	0	4	0	0	4	0	0	4
ST 47_4	Natural	0	0	0	0	0	0	0	0	0
ST 47_4A	Natural	0	0	0	0	0	0	0	0	0
ST 47_4B	Natural	0	0	0	0	0	0	0	0	0
ST 47_5	Natural	0	0	0	0	0	0	0	0	0
ST 47_CL	Natural	0	0	4	0	0	4	0	0	3
ST 47_CLA	Natural	0	0	0	0	0	0	0	0	0
ST 47_PO	Natural	0	0	0	0	0	0	0	0	0
ST 48_1	Natural	0	0	0	0	0	0	0	0	0
ST 48_3	Natural	0	0	3	0	0	3	0	0	3
ST 48_4	Natural	7	16	33	7	16	33	7	16	33
ST 48_4A	Natural	2	15	35	2	15	35	2	15	35
ST 48_5	Natural	0	0	17	0	0	17	0	0	17
ST 48_5M	Natural	0	0	17	0	0	17	0	0	17
ST 48_BL	Natural	12	19	31	12	19	31	12	19	31
ST 48_BLM	Natural	11	16	-32	11	16	-32	11	16	-32
ST 48_CL	Natural	0	3	9	0	3	9	0	3	9
ST 48_NI	Natural	12	24	33	12	24	34	12	24	33
ST 48_NIA	Natural	0	0	0	0	0	0	0	0	0
ST 48_PO	Natural	0	0	18	0	0	18	0	0	18
ST 48_POA	Natural	1	-13	-36	1	-13	-36	1	-13	-36
ST 48_ST	Natural	0	123	456	0	124	453	0	124	454
ST 48_WE	Natural	0	4	13	0	4	13	0	4	13
ST 49_1.1	Natural	47	99	184	48	99	184	47	99	184
ST 49_2	Natural	0	0	39	0	0	39	0	0	39
ST 49_2M	Natural	0	0	41	0	0	41	0	0	41
ST 49_3	Natural	0	0	8	0	0	9	0	0	8
ST 49_3A	Natural	0	0	0	0	0	0	0	0	0
ST 49_4	Natural	18	19	18	18	20	18	18	20	18
ST 49_4A	Natural	0	0	1	0	0	1	0	0	1
ST 49_5	Natural	0	0	0	0	0	0	0	0	1
ST 49_5M	Natural	0	0	2	0	0	1	0	0	2

Table B7 -XPSWMM Link Results
I-35W Corridor Drainage Study

Link Name	Shape	Existing Conditions Peak Flow Rates (cfs)[1]			Proposed Conditions Peak Flow Rates (cfs)[2]			Proposed Conditions with Rate Control Structure Peak Flow Rates (cfs)[3]		
		2 year	10 year	100 year	2 year	10 year	100 year	2 year	10 year	100 year
ST 49_5MI	Natural	0	1	2	0	1	2	0	1	3
ST 49_CL	Natural	13	29	55	13	29	55	13	29	55
ST 49_NI	Natural	32	75	148	32	75	148	32	75	148
ST 49_PLM.	Natural	0	0	0	0	0	0	0	0	0
ST 49_ST.1	Natural	59	96	127	59	96	125	59	96	131
ST 49_STB	Natural	27	96	641	22	117	585	21	90	635
ST 49_STC	Natural	31	145	962	27	176	1005	27	155	1065
ST 49_STE	Natural	-9	18	80	-9	-15	86	-8	12	87
ST 49_WE.1	Natural	8	20	37	8	20	37	8	20	37
ST 49_WEM	Natural	6	18	35	6	18	35	6	18	35
ST 5_43AD	Natural	0	0	0	0	0	0	0	0	0
ST 5_46M	Natural	0	0	0	0	0	0	0	0	0
ST 50_1	Natural	0	0	0	0	0	0	0	0	0
ST 50_BE	Natural	0	6	16	0	6	16	0	6	16
ST 50_BEA	Natural	0	3	7	0	3	7	0	3	7
ST 50_NI	Natural	6	16	34	7	16	34	7	16	34
ST 50_NIA	Natural	8	22	49	8	22	49	8	22	49
ST 50_ST	Natural	0	0	0	0	0	0	0	0	0
ST 50_STA	Natural	0	4	19	0	4	19	0	4	19
ST 50_STB	Natural	0	3	17	0	3	17	0	3	17
ST 51_ST	Natural	0	2	7	0	2	7	0	2	7
ST BE_50	Natural	7	18	35	7	18	35	7	18	35
ST BE_61	Natural	1	5	9	1	5	9	1	5	9
ST N510	Natural	0	-1	-18	0	-1	-18	0	-1	-18
ST NI_RU	Natural	9	22	42	9	22	42	9	22	42
ST R53	Natural	0	9	23	0	9	23	0	9	23
ST RU.1	Natural	0	0	0	0	0	0	0	0	0
ST RU_WE	Natural	0	0	0	0	0	0	0	0	0
ST ST_49F	Natural	0	8	26	0	8	26	0	8	26
ST ST_RU	Natural	10	134	876	10	134	851	10	134	859
ST WE_RU	Natural	0	0	0	0	0	0	0	0	0
ST43_2	Natural	2	4	8	1	2	8	2	2	8
ST43_3	Natural	3	16	40	3	16	40	3	16	40
ST44_3 ALL	Circular	2	5	7	2	5	7	2	5	7
ST44_3 MID	Natural	1	1	0	1	2	0	0	0	0
ST44_CL	Natural	1	4	23	0	4	23	1	4	23
ST44_POA	Natural	52	100	169	52	94	169	51	95	169
ST45_CL	Natural	3	16	42	4	14	45	3	14	42
ST48_BL AL	Natural	1	3	45	1	3	45	1	3	45
ST48_NI	Natural	7	-23	44	7	-23	44	7	-23	44
ST48_PO	Natural	2	18	45	2	18	45	2	18	45
ST49_4	Natural	39	75	135	39	75	135	39	75	135
ST49_RU A	Natural	0	0	0	0	0	0	0	0	0
Ste-24-25.	Natural	3	25	50	3	25	50	3	25	50
Ste-25-26.	Natural	0	0	0	0	0	0	0	0	0
UPS-1	Circular	0	0	0	0	0	0	0	0	0
upstream	Natural	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0	32	#N/A
V20617-3	Natural	0	0	0	0	0	0	0	0	0
VPS-1	Circular	4	4	4	4	4	4	4	4	4
VPS-2	Natural	0	0	0	0	0	0	0	0	0
VPS-3	Circular	4	4	4	4	4	4	4	4	4

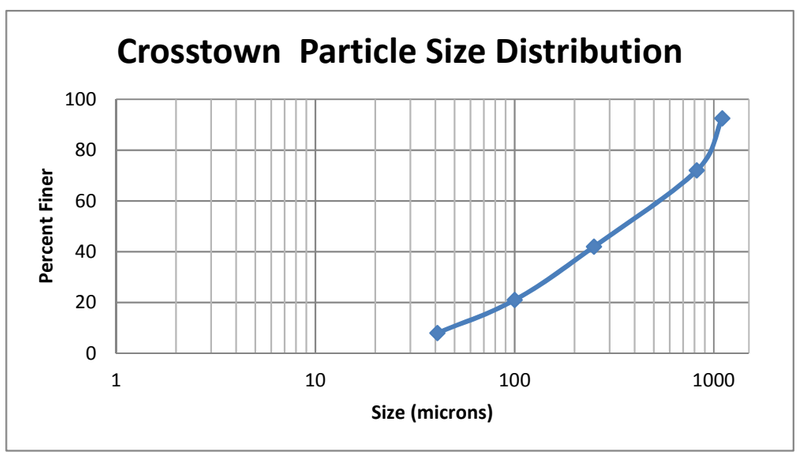
Table B8 - SPCD Sensitivity Analysis
I-35W Corridor Drainage Study
HENNC 113114
Date: 5.14.14
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Tables

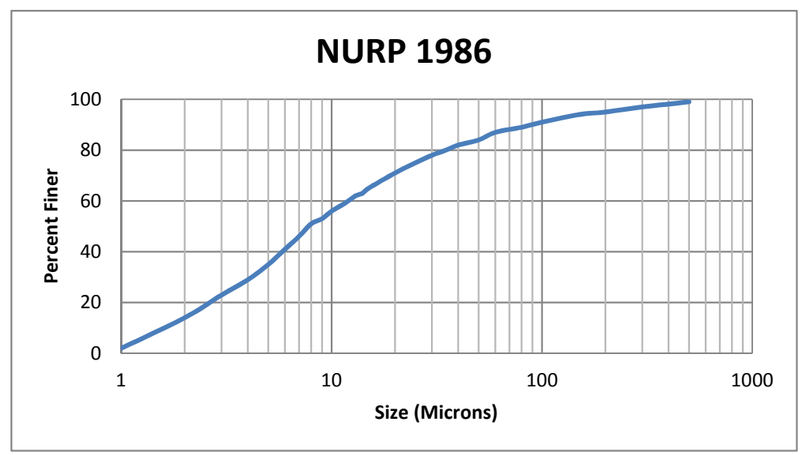
Inputs	**Run 1**	**Run 2**	**Run 1**	**Run 2**	**Run 1**	**Run 2**	**Run 1**	**Run 2**
BMP	Stormceptor	SAFL Baffle	Stormceptor	SAFL Baffle	Stormceptor	SAFL Baffle	Stormceptor	SAFL Baffle
Model	3600	86	3600	86	3600	86	3600	86
Diameter	8	8	8	8	8	8	8	8
Precipitation	Minneapolis, 1995	Minneapolis, 1995	Minneapolis, 1995	Minneapolis, 1995	Minneapolis, 1995	Minneapolis, 1995	Minneapolis, 1995	Minneapolis, 1995
Particle Size	Crosstown Study	Crosstown Study	Crosstown Study	Crosstown Study	Crosstown Study	Crosstown Study	Crosstown Study	Crosstown Study
Watershed Data								
Area, ac	5	5	5	5	10	10	10	10
Impervious %	75	75	75	75	75	75	75	75
Hydraulic Length, ft	150	150	500	500	150	150	500	500
Ave. Slope, %	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
CN (pervious)	69	69	69	69	69	69	69	69
Temperature	St. Paul, 1995	St. Paul, 1995	St. Paul, 1995	St. Paul, 1995	St. Paul, 1995	St. Paul, 1995	St. Paul, 1995	St. Paul, 1995
Influent Concentration (mg/l)	200	200	200	200	200	200	200	200
Total Load (lbs)	208	208	208	208	416	416	416	416
Total Load Removed (lbs)	166	150	168	159	306	249	314	262
Load Removed per Year (lbs)	13.83	12.50	14.00	13.25	25.50	20.75	26.17	21.83
Percent Difference-TSS Removal	10.13%		5.50%		20.54%		18.06%	

Table B9 - Particle Curve Analysis
I-35W Corridor Drainage Study
HENNC 113114
Date: 5.14.14
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Tables

Inputs	**Run 1**	**Run 2**	**Run 1**	**Run 2**
BMP	Stormceptor, 3600 Model	Stormceptor, 3600 Model	Stormceptor, 3600 Model	Stormceptor, 3600 Model
Precipitation	Golden Valley, MN (1995-2006)	Golden Valley, MN (1995-2006)	Golden Valley, MN (1995-2006)	Golden Valley, MN (1995-2006)
Particle Size	NURP-PSD.txt	Crosstown Study	NURP-PSD.txt	Crosstown Study
Watershed Data				
Area, ac	10	10	10	10
Impervious %	85	85	85	85
Hydraulic Length, ft	100	100	50	50
Ave. Slope, %	1	1	1	1
CN (pervious)	65	65	65	65
Temperature	St. Paul, MN (1991-2007)	St. Paul, MN (1991-2007)	St. Paul, MN (1991-2007)	St. Paul, MN (1991-2007)
Influent Concentration (mg/l)	200	200	200	200

Total Load (lbs)	51.8	51.8	50.3	50.3
Total Load Removed (lbss)	3.5	29.9	3.4	29.2
Load Removed per Year (lbss)	0.3	2.5	0.3	2.4





This Page Left Blank Intentionally

Table B10 - Adjusted Drainage Basins
I-35W Corridor Drainage Study
HENNC 113114
Date: 6.23.14
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Tables

			Proposed Conditions	
SPCD #	**Name**	**GIS Drainage Area (ac)**	**Impervious Area[1] (ac)**	**Impervious Percentage**
1	DS1(39th)	6.86	4.37	63.74%
	Sub Total	**6.86**	**4.37**	**63.74%**
2	35th_C	8.74	4.91	56.18%
	35th_D	2.23	1.66	74.57%
	Sub Total	**10.97**	**6.57**	**59.91%**
3	DS2(35th)	6.49	4.60	70.88%
	Sub Total	**6.49**	**4.60**	**70.88%**
4	M15102	11.26	5.58	49.56%
	M15119	7.55	4.62	61.15%
	Sub Total	**18.81**	**10.20**	**54.21%**
5	M14578	3.28	1.53	46.65%
	M14370	3.61	3.42	94.82%
	M14298	5.19	3.46	66.67%
	M14368	5.84	3.16	54.15%
	M13902	1.10	0.33	30.00%
	M13907	1.06	0.48	45.28%
	Sub Total	**20.07**	**12.38**	**61.68%**
6	M15041	10.36	7.65	73.86%
	M15027	5.46	4.14	75.83%
	M15022	10.51	7.85	74.67%
	M14371	8.62	8.19	95.01%
	M14714	2.51	2.38	94.82%
	M14695	2.43	2.18	89.71%
	Sub Total	**39.89**	**32.39**	**81.20%**
7	L14989	8.16	3.62	44.35%
	L15012	8.40	3.96	47.16%
	L15005	4.90	1.90	38.78%
	Sub Total	**21.46**	**9.48**	**44.18%**
8	L14678	1.56	0.67	42.95%
	L14613	1.74	0.96	55.04%
	L14670	1.58	1.00	63.29%
	L14984	4.51	1.48	32.82%
	L15000	4.55	1.61	35.38%
	Sub Total	**13.94**	**5.72**	**41.02%**
9	Lake-4th	6.42	5.20	80.97%
	Sub Total	**6.42**	**5.20**	**80.97%**
10	Lake-Clin	5.60	3.61	64.45%
	Sub Total	**5.60**	**3.61**	**64.45%**
11	Lake-2nd	2.34	1.11	47.51%
	Lake-3rd	1.63	1.11	68.29%
	Sub Total	**3.96**	**2.22**	**56.03%**
12	29-35W-1	4.21	3.93	93.35%
	Sub Total	**4.21**	**3.93**	**93.35%**
13	29-35W-2	4.90	4.36	88.98%
	Sub Total	**4.90**	**4.36**	**88.98%**
14	28-Stev	7.65	4.20	54.90%
	Sub Total	**7.65**	**4.20**	**54.90%**
15	28-35W	4.35	2.83	65.08%
	Sub Total	**4.35**	**2.85**	**65.54%**
16	26-35W	5.07	2.73	53.85%
	27-35W	4.28	2.35	54.90%
	Sub Total	**9.35**	**5.08**	**54.33%**
17	MH SB 32-2	5.40	4.48	82.98%
	Sub Total	**5.40**	**4.48**	**82.98%**
18	DS15	4.39	3.02	68.79%
	Sub Total	**4.39**	**3.02**	**68.79%**
19	CBWB 236-2	4.89	2.61	53.38%
	Sub Total	**4.89**	**2.61**	**53.38%**
20	DS16	6.35	3.19	50.20%
	Sub Total	**6.35**	**3.19**	**50.20%**
21	CB NB 55-2	9.19	7.48	81.38%
	Sub Total	**9.19**	**7.48**	**81.38%**

[1] Includes existing impervious and project proposed impervious

This Page Left Blank Intentionally

Table B11 - Water Quality Treatment Breakdown
I-35W Corridor Drainage Study
HENNC 113114
Date: 7.10.14
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Tables

MWMO Goal: 90% removal of TSS from the design storm (1.17 inches in 24 hours)

	TSS (lbs)
Project Loading[1]	4770
90% TSS Removal Goal	4293
Filtration Basin Removal[2]	1185
SAFL Baffle® Removal[3]	4822
Total Treatment	6007
Excess Treatment	**1714**

[1]Modeled in SHSAM®

[2] 25% of overall loading, modeled in P8

[3] See SAFL Baffle® Treatment Analysis for TSS removal amounts
Includes all modeled SAFL Baffles®

Table B12 - SAFL Baffle® Treatment Analysis
I-35W Corridor Drainage Study
HENNC 113114
Date: 6.23.14
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Tables

Table 1. Total Project Removal Goal (TSS -lbs)

Project Area	ROW (ac)	Proposed Impervious Area (ac)	Proposed Impervious (%)	Hydraulic Length (ft)	Total TSS Load (lbs)	WMO Goal for 90% Removal (lbs)
94 Commons	57.5	25.6	44.5			
Transit Access	41.2	35.9	87.2			
Gap	42.1	23.3	55.4			
Project ROW	**140.8**	**84.8**	**60.2%**	**1000**	**4770**	**4293**

Table 2. SHSAM Modeling Parameters

SPCD Name	Model	Model Height (ft)	Model Diameter (ft)	Ave. Slope (%)	CN (pervious)
SAFL Baffle	86	6	8	0.5	69

Table 3. SAFL Baffle Analysis and Results

Project Segment	SPCD Locations	Drainage Area (ac)	Proposed Impervious Area (ac)	Proposed Impervious (%)	Average Roadway Slope (%)	Incoming Pipe Diameter (in)	Hydraulic Length (ft)	Adjusted HydroCAD Hydraulic Length (ft)	Total Load (lbs)	Load Removed (lbs)
Gap	1	6.9	4.4	64	0.85	21	125*	1250	247	172
	2	11.0	6.6	60	0.43	21	125*	1200	370	241
	3	6.5	4.6	71	2.00	33	100*	1350	257	195
	Totals	**24.3**	**15.5**	**64**					**874**	**608**
Transit/Access	4	18.8	10.2	54	0.40	33	550		576	357
	5	20.1	12.4	62	0.40	33	320		700	391
	6	39.9	32.4	81	0.40	42	500		1782	790
	7	21.5	9.5	44	0.20	42	500		546	395
	8	13.9	5.7	41	0.40	18	500		332	198
	9	6.4	5.2	81	0.40	18	500		286	168
	10	5.6	3.6	64	0.33	30	450		201	158
	11	4.0	2.2	55	0.33	21	180		125	96
	12	4.2	3.9	94	1.00	15	250*	575	216	123
	13	4.9	4.4	90	3.50	18	450*	675	242	141
	14	7.7	4.2	55	2.00	33	300		241	174
	15	4.4	2.9	66	1.20	42[+]	340*	360	163	134
	16	9.4	5.1	55	0.73	48[++]	350*	550	293	237
	Totals	**160.6**	**101.7**	**63**					**5703**	**3362**
94 Commons	17	5.4	4.5	83	0.33	30	200*	975	246	190
	18	4.4	3.0	68	2.00	30	300*	330	167	127
	19	4.9	2.6	53	1.67	24	225*	410	148	111
	20	6.4	3.2	50	0.33	15	645		183	126
	21	9.2	7.5	81	0.40	36	320*	1175	411	298
	Totals	**30.2**	**20.8**	**69**					**1155**	**852**
Total Load Removed (lbs) -										**4822**

*Hydraulic length used in SHSAM was the Adjusted HydroCAD Hydraulic Length
[+]Pipe upsized from existing diameter
[++]Existing storm sewer is 60". SAFL Baffles® less effective if inpipe is greater than 48".

Table B13 - Stormceptor® Treatment Analysis
I-35W Corridor Drainage Study
HENNC 113114
Date: 6.26.14
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Tables

Table 1. Total Project Removal Goal (TSS -lbs)

Project Area	ROW (ac)	Proposed Impervious Area (ac)	Proposed Impervious (%)	Hydraulic Length (ft)	Total TSS Load (lbs)	WMO Goal for 90% Removal (lbs)
94 Commons	57.5	25.6	44.5			
Transit Access	41.2	35.9	87.2			
Gap	42.1	23.3	55.4			
Project ROW	**140.8**	**84.8**	**60.2%**	**1000**	**4770**	**4293**

Table 2. SHSAM Modeling Parameters

SPCD Name	Model	Model Height (ft)	Model Diameter (ft)	Incoming Pipe Diameter (in)	Ave. Slope (%)	CN (pervious)
Stormceptor	3600	11.2	8	8	0.5	69

Table 3. Stormceptor Analysis and Results

Project Segment	SPCD Locations	Drainage Area (ac)	Proposed Impervious Area (ac)	Proposed Impervious (%)	Average Roadway Slope (%)	Incoming Pipe Diameter (in)	Hydraulic Length (ft)	Adjusted HydroCAD Hydraulic Length (ft)	Total Load (lbs)	Load Removed (lbs)
Gap	1	6.9	4.4	64	0.85	21	125*	1250	247	199
	2	11.0	6.6	60	0.43	21	125*	1200	370	291
	3	6.5	4.6	71	2.00	33	100*	1350	257	205
	Totals	**24.3**	**15.5**	**64**					**874**	**695**
Transit/Access	4	18.8	10.2	54	0.40	33	550		576	426
	5	20.1	12.4	62	0.40	33	320		700	494
	6	39.9	32.4	81	0.40	42	500		1782	1044
	7	21.5	9.5	44	0.20	42	500		546	411
	8	13.9	5.7	41	0.40	18	500		332	261
	9	6.4	5.2	81	0.40	18	500		286	225
	10	5.6	3.6	64	0.33	30	450		201	164
	11	4.0	2.2	55	0.33	21	180		125	104
	12	4.2	3.9	94	1.00	15	250*	575	216	172
	13	4.9	4.4	90	3.50	18	450*	675	242	190
	14	7.7	4.2	55	2.00	33	300		241	190
	15	4.4	2.9	66	1.20	42+	340*	360	163	132
	16	9.4	5.1	55	0.73	60	350*	550	293	231
	Totals	**160.6**	**101.7**	**63**					**5703**	**4044**
94 Commons	17	5.4	4.5	83	0.33	30	200*	975	247	194
	18	4.4	3.0	68	2.00	30	300*	330	167	136
	19	4.9	2.6	53	1.67	24	225*	410	148	121
	20	6.4	3.2	50	0.33	15	645		216	176
	21	9.2	7.5	81	0.40	36	320*	1175	411	317
	Totals	**30.2**	**20.8**	**69**					**1189**	**944**
Total Load Removed (lbs) -										**5683**

*Hydraulic length used in SHSAM was the Adjusted HydroCAD Hydraulic Length
+Pipe upsized from existing diameter

This Page Left Blank Intentionally

TABLE B14 - Stormwater BMP Master List
i-35 Corridor Drainage Study

I-35W Corridor Drainage Study
Stormwater BMP Master List
HENNC 1113114
Updated:10.10.13

Promotes		BMP	Goal(s) Met	Description	Pollution Removal	Pros	Cons
INFILTRATION	Surface	Permeable Pavement[a]	Rate Control Water Quality Volume Control	Options are pervious concrete, porous asphalt, permeable interlocking concrete pavers, plastic and concrete grids, and amended soils Pollutants removed depends on size of storage volume	[1]TSS- 74% TP-45%	Infiltrates stormwater Reduce runoff quantity Reduce TSS and TP loads into water Reduce runoff temperatures Delays formation of frost layer, reduces frost depths when frozed Less deicing chemicals and sand required	Expensive Needs pretreatment (usually grass buffers on sides of pavement) No sand in winter Not good for high, repitive truck traffic Reduced lifespan due to clogging O&M required to prevent clogging (vacuuming) Pavements need to be at least 100 ft from municipal water supply well Min. of 3 ft required between permeable pavement reservior layer and seasonal high groundwater table
		Infiltration Basin[a]	Rate Control Water Quality Volume Control	Basin that catures, stores, and infiltrates stormwater runoff within 48 hours	[1]TSS- 100% TP- 100%	Increases groundwater recharge Improves surface water quality Provides thermal benefits (ex. Cold water fisheries) Mimics pre-development hydrology	Potential for groundwater contamination Clogging over time w/o maintenance Not good for areas with steep slopes May require landscaping Poor freeze suitability
	Underground	Underground Storage Chamber[a] (Concrete Structures, Plastic Arch Structures)	Water Quality Volume Control Rate Control	Conspan, Crete Bridge Arch Sections C ontech, ADS	TSS TP	No surface area required Acceptable for cold environments	Maintenance (street sweeping, annual cleaning of floatables)
		Perforated Pipe Galleries[a] (Contech, ADS)	Rate Control Water Quality Volume Control	Pipes that temporarily store and treat runoff. Usually corrugated metal pipes. Can be released to storm sewerx Perforations in pipe to allow for infiltration One source says $3-10 per cubic foot of water stored	TSS TP	No surface area required Improves water quality	Localized Rate Control Provided Regular maintenance to prevent clogging and remove flotables
STORMWATER POND	Surface	Wet Sedimentation Basin[b]	Rate Control Water Quality	Storm water pond designed based on NURP standards	[1]TSS-60-90% TP-34-70%	Most cost effective for runoff detention storage	Consume a large amount of space; Tend to increase water temperature and may cause downstream thermal impact; Have the potential for nuisance insects or odor; Are problematic for areas of low relief, high water table, or near-surface bedrock; and Pose safety concerns
	Underground	Underground Wet Storage Chamber[a]	Water Quality Rate Control Volume Control	Precast concrete structure designed to retain a permanent pool and provide flood storage for stormwater	TSS TP	Can be constructed within existing right-of-way corridors	Located under infastructure Access and conducting maintenance is difficult There is a high potential for features to leak, potentially settling soils around the facility
FILTRATION		Trench Forebays[b]	Water Quality	Linear, above ground cleaning devices Stormwater is routed to trench by pipe Trench is made of concrete, planted with wetland plants	TSS- TP-	Provides pretreatment before main BMP Reduces stress on main BMP	Sediment needs to be scooped out every 5 years or so O&M required Design size is small Roadway can constrain design
		Underground Filtration System[b] (Delaware or DC Sand Filter)	Volume Control Water Quality	2-3 filtration vaults underground, performs pre-treatment, filtration, and discharge	[6]TSS- 85 % Low nutrient removal	Does not need ground surface area Good for first flush of sediment May have prefabricated units now	Estimated $10,000-$20,000 per impervious acre
		Bioretention[a]	Rate Control Water Quality Volume Control	Depressed basin located within Landscaping islands, cul-de-sacs, parking lot margins, commercial setbacks, open space, rooftop drainage, street-scapes Located upwards of stormwater treatment methods Should be used outside of main flow lines/routes Can be built after construction and landscaping finished	[1]TSS-85% TP-65%	Can remove pollutants through vegetative filtering, settling, evaporation, infiltration, transpiration, biological and microbiological uptake, soil adsorption High permeable soils good for infiltration/recharge practice Low permeable soils use rock infiltration gallery for slow infiltration/recharge	May not treat snowwater well because of dormancy of vegetation during winter Requires pretreatment to remove large sediment Highly recommended to use in conjunction with detention or other control Not to be used in areas with continuous flow from groundwater, sump pumps, etc
		Bioswale[b]	Water Quality	Removes silt and pollution Drainage course with sloped sides of vegetation, compost or riprap Water flow path maximizes time water is in system	Pollutants and silt	Less expensive than underground piping Usually built to convey 10 year storm Less O&M, no water or fertilizer needed	

TABLE B14 - Stormwater BMP Master List
i-35 Corridor Drainage Study

Project Applicability				Agency Comments		
Potential Locations	**Maintenance**	**Notes**	**Feasibility**	**City of Minneapolis**	**MnDOT**	**Hennepin County**
Parking Areas, Roadway Shoulders		Potential locations do exist in project site MNDOT not a large suppoorter WQ goals need to be calculated for each site and effects are not directly correlated to land size. Other factors need to be considered.	Very Low			
Offsite Areas		Potential locations include areas off site of the project that are treated to mitigate for the improvements along the corridor. Pretreatment will need to be provided in another feature prior to the storm water reaching the infiltration basin Best in areas with slopes less than 20% and at least 3 feet to bedrock	High (off site areas)			
Under impervious surfaces		Appropriate for areas with poor infiltration (ie clay soils) Should coordinate with new pavement areas	Moderate			
Under impervious surfaces		Appropriate for areas with poor infiltration (ie clay soils) Should coordinate with new pavement areas	Moderate			
Regional facility located off site of the project roadway corridor. The facility would be designed to offset any impacts as part of the roadway projects at an off site location		Offsite regional facility. 25 acre drainage area minimum	High (off site aras)			
Underground storage chamber could be located within the roadway corridor or offsite areas. The feasibility of constructing an underground feature with a permanent pool is unlikely directly under the traffic lanes. Possibly can be located in shoulder or gore areas of the roadway corridor			Moderate			
		Not viable on project based on limited treatment provided based on the capacity of the features	Very Low			
Underground Filtration Systems can be used in shallowly dug areas. Since this method is shallow under the ground surface, it can quickly be placed.		Shallow treatment method				
Parking Areas, Areas outside of the mainline roadway corridor		Designed to provide treatment for a small WQ volume. Does not provide rate control for larger storm events >10year.	Very Low			
Can be used around impervious surfaces and on sloped land.						

TABLE B14 - Stormwater BMP Master List
i-35 Corridor Drainage Study

I-35W Corridor Drainage Study
Stormwater BMP Master List
HENNC 1113114
Updated:10.10.13

Promotes		BMP	Goal(s) Met	Description	Pollution Removal	Pros	Cons
FILTRATION		Iron Enhanced Sand Filter (Minnesota Filter)[b]	Water Quality	Filtration media mixed with iron Only best with iron enhanced sand filter basins and iron enhanced sanbd beach in wet ponds	TP- 50-70% TSS removal same as typical sand filter	Removal of several colloidal and dissolved constituents, including color and phosphates High pollutant removal rates Use as a retrofit for existing ponds and other stormwater BMPs Good for nutrient impaired water Could be used at sites with certain types of restrictions where infiltration is not appropriate or feasible Vegetative filter not needed before treatment Suitable for cold climates	Can plug the filtration media in low oxygen or persistently inundated filtration practices Requires underdrains Exit drain needs to be exposed to atmoshpere to aerate Recommended to have overflow diversion to control high volumes of water New technology with somewhat limited phosphorus removal performance history Best for urban watersheds or runoff with moderate sediment loads Lifespan of iron-enhanced filtration practice potentially reduced by clogging or iron loss Head required for treatment and draw down of filter between storms Tailwater effects may restrict siting of filters Vegetation should not be allowed to grow over the iron enhanced media. Decomposed vegetation may reduce oxygen in the filter media and cause a chemical change in the iron resulting in filter media fouling. Lifespan of the filter potentially limited by repeated clogging and cleaning cycles Disposal of the iron-sand bed material will be required when the iron is consumed Iron-sand filtration offers limited water quantity control Accumulation of senesced and decomposed plant material in the filter bed (e.g., due to leaf litter accumulation or if vegetation is allowed to grow on the filter bed) may cause low oxygen conditions and iron loss or fouling over time
		Filtration Basins/Bioretention Basins[b]	Water Quality	Media filters, vegetative filters, or combination	[1]TSS- 70 - 85% TP- 0-50%	Good for highly impervious areas with low sediment/high pollutant load (e.g. urban land use and retrofit scenarios) High pollutant removal rates May be used in a variety of soil types Good for the treatment of hotspots because it can be isolated from groundwater if contamination concerns exist Deals well with freeze/thaw	Higher maintenance requirements Some installations (media filters) have higher construction costs Potential to cause odor problems Minimal treatment of soluble nutrients Potential for nitrification in media filters where anaerobic conditions exist
STRUCTURAL POLLUTION CONTROL DEVICES		Detention Vaults[b]	Rate Control Volume Control	Underground structure to hold stormwater Made of concrete or CMP Pretreatment at inlet, can use flow splitters to direct only a portion of stormwater	[2, 4]TSS- 60-80% TP- 20-40%	Stormwater flows can be released after peak storm flows Helps with runoff quality control	Concrete vault is expensive, CMP less expensive No water quality control O&M required, very few need weekly maintenance Pretreament often required
		Oil-Grit Separators[b]	Water Quality	Separates sediment and particulate matter, oils Usually 3-4 chambers	Large sediments, particulate matter, debris, hydrocarbons	Removes oils and gas well	Detention time < 30 min for large storm Poor pollutnat removal, mainly removes by settlement Needs to be cleaned out after each storm
		Manufactured Systems[b]	Water Quality	*Vortex Motion* and/or *Conventional Settling Chamber* separates out large sediment and oil Treats 1,110 gal/min on average $9900-$26800 per treated hectare (ave)	2	Can retrofit an existing stormwater structure treats low-moderate storm flows allows for high stormwater bypass Filters both oils and sediments Quick installation	Cleanout at least once per year
		Biofilters[b]	Water Quality	Uses sedimentation, filtration, biological action to manage pollutnats RO treated over 5-10 days Stormwater enters filter through root zone $3600-$4000 to install 1 tank (1996 $'s)	[2]TSS- 95% TP- 89%		
		Vegetated Rock Filters[b]	Water Quality	Series of connected tanks with depth of aggregate, planted with wetland species	[2]TSS- 95% TP- 82%		3-5% of drainage area needed for system high cost
		Vertical Filter System[b]	Water Quality	One chamber for storage and settling area	[2]No good results on removal yet	Small Footprint	Clogging of geotextile fabric Sand loss b/c high hydraulic pressures Resuspension--clogs filter
		Gross Solids Removal[b]	Water Quality	Removes trash and larger solids, debris	5		
		Street Sweeping[b]	Water Quality				
		Tree Box Filters[b]	Water Quality	Install box around tree with grate to catch RO and stop trash from going to discharge			
	Sediment Removal	Hydrodynamic Devices[b]	Water Quality	Removes solids, oil/grease, floatables, debris Used in conjunction with other BMPs Solids settle out of water column	TSS-	Units are typically underground and do not consume much site space Can often be easily incorporated into fully developed sites Can be used for pre-treatment prior to other practices Suitable for cold climates if installed below frost line	Each type of unit has specific design constraints and limitations for use Treatment may be reduced if frequent maintenance is not conducted May not meet local standards when used alone Generally good for solids and litter, but much less effective for other common pollutants.
		Filtration Devices[b]	Water Quality	Water passes through filter media Mainly solids and oils removed Filter media can be a screen, fabric, activated carbon, perlite, zeolite, or combination Different than typicalstormwater filters, these are proprietary and usually inserted into hydraulic infrastructure	TSS- TP-	Units are typically underground or within existing structures and do not consume much site space Filtration devices can be customized to reduce a specific pollutant of concern Can often be easily incorporated into fully developed sites Can be used for pre-treatment prior to infiltration practices Relevant for use on industrial sites because filters can remove pollutants such as metals and oils	Efficiency has not been widely tested Each type of unit has specific design constraints and limitations for use Can be more costly that other treatment methods Treatment may be greatly reduced if frequent maintenance is not conducted Subject to freezing in cold climates

TABLE B14 - Stormwater BMP Master List
i-35 Corridor Drainage Study

Project Applicability				Agency Comments		
Potential Locations	Maintenance	Notes	Feasibility	City of Minneapolis	MnDOT	Hennepin County
Must be located outside continuous flow paths because filter must dry out to be effective.		Useful in high impervious areas Can be used by adding iron to other filtration BMPs	High			
Typically has a maximum drainage area of 5 acres, area must be relatively flat (<20% slope)						
Must be located to easily gain access for O&M						
Areas with small amount of runoff						
		4 tanks to manage 0.5 in of stormwater generated by 1 ac w/ preliminary detention				
			High			
Used in underground chambers, catch basins, tranch drains, roof drains						

TABLE B14 - Stormwater BMP Master List
i-35 Corridor Drainage Study

I-35W Corridor Drainage Study
Stormwater BMP Master List
HENNC 1113114
Updated:10.10.13

Promotes		BMP	Goal(s) Met	Description	Pollution Removal	Pros	Cons
Smaller BMPs							
		Stormwater Re-Use and Rainwater Harvesting	Rate Control Water Quality Volume Control	Rain barrels for rooftops (also includes cisterns, evaporative control systems)	[1]TSS - 100% TP- 100%	Water can be used for other purposeses (watering lawn) Reduces water demand in summer months If water dumped out later, allows infiltration Residents as well as businesses can participate Lessens amount of water going to stormwater drain	Potential to breed mosquitos if not emptied Barrels need to be disconnected and removed in winter Not suitable for tar, gravel, asbestos shingle, treated cedar shakes roofs Requires O&M Initial cost can be high
		Chemical Treatment	Water Quality	Settling of suspended sediment enhanced by encouraging flocculation Chemicals may include aluminum sulfate, ferric chloride, chitosan, polyacrylamide Used for temporary erosion control practices	TSS- TP-	Quickly removes suspended clays and silts Can be used as pre-treatment to remove suspended sediments prior to infiltration Can help project meet stringent water clarity and sediment-bound pollutant removal standards Suitable for cold climates	Ongoing operation and maintenance of the chemical addition system may be required Monitoring may be required to determine the impact on downstream resources A pond or sediment collection area is necessary downstream of the treatment site for settling out the flocculants May require permit from DNR Expensive to build and operate
		Green Roofs	Rate Control Water Quality Volume Control		[1]TSS - 90% TP - 100%	Slows stormwater runoff Insulates buildings, lowers energy costs Animal habitat	Expensive start up cost Requires O&M MN weather can make growth difficult Biulding leaks
		Turf	Rate Control Water Quality Volume Control	Installing grass, removing impervious area and replacing with turf		Increase infiltration Reduce runoff Adsorbs nutrients Filters sediment Decomposes pollutnats Moderates peat stream flows Supports plants	Requires O&M to start/seed
		Trees	Rate Control Water Quality Volume Control	Increasing tree canopy will increase transpiration and decrease rate and volume of runoff			
		Swales	Rate Control Water Quality	Ditch with mild slope	Allows for more time for infiltration to reduce pollutants traveling to water	Water can be directed to desired location Reduces soil erosion	Roadway can constrain design
		Stormwater Wetlands	Rate Control Water Quality Volume Control	Wetlands include shallow marsh area, permanent micropool area, storage volume above the normal water level	[1]TSS- 75% TP- 40%	Educational for residents, provides animal habitats	More surface area required than ponds Performance diminished with large volumes of runoff in short time with high pollutnats Can freeze in winter Needs careful design and planning to ensure wetland hydrology is maintained Water quality behavior can change seasonally
		Leaching Chambers	Rate Control Water Quality	Pre-cast, perforated concrete structures, surrounded by crushed stone Underground, RO from road is diverted into storm drain with settling basin. After solids settle, water is piped under roadway into leaching chamber. Water is stored in chambers and in voids until it seeps into soils		Underground, no ground surface area needed	
		Alum Injection Systems	Water Quality	Treats commonpollytants by chemically fixing them into an inert floc that settles Nontoxic aluminum salt formed	[2]TSS- TP-	Small footprint, can treat whole watersheds, (drainage areas btn 90-160 acres) Capital cost independent from size of system U	
		Multi-Chamber Treatment Train (MCTT)	Water Quality	Mimic treatment chambers found in wastewater treatment Water first aerated (preliminary settling) then into a tray settler, then dissolved air flotation (lifts oils and floatables), then through sand/peat filter	[2]TSS-	Study showed 87% of rainfall volume passing through structure	Relatively expensive Very site specific
		Catch Basin Inserts	Water Quality	Hang from drain-inlet frame or below drain inlet Gravitational filtration $100-$1500 per unit		Also have a high flow bypass to prevent resuspension and washout Has an outlet for stormwater overflow Improving oil/grease/sediment removal Inserts are lightweight material	Not suitable for fine particulates: metals, nutrients, silts, clays Need regular cleaning Filter needs to be replaced if saturated with oil/gas
		Community Gardens	Water Quality				
		Tile Drains	Volume Control				
		Catch Basin Adoption	Water Quality				
		"Urban Road" to "Rural Road"		Replace curb and gutter with swales			
		Soil Amendments	Rate Control Water Quality Volume Control	Add soil conditioners and fertilizer to help plant growth	[3]TSS- TP-	More plant growth	
		Natural Vegetative Landscaping	Rate Control Water Quality Volume Control	Landscaping	[3]TSS- TP-	Infiltrate rainfall, decreases stormwater volumes	O&M for plant upkeep
		Bioslope (Ecology Embankment)	Rate Control Water Quality Volume Control	Enbankments that filter runoff throuhg engineered soil media known as an *ecology mix.* Similar to vegetated filter strips, RO if rapidly infiltrated into gravel trench then filters out	[3]TSS- TP-	Routine, periodic maintenance, same as side slope maintenance	Not signigficant detention Minimal retention storage May still requrie underdrain

TABLE B14 - Stormwater BMP Master List
i-35 Corridor Drainage Study

Project Applicability				Agency Comments		
Potential Locations	Maintenance	Notes	Feasibility	City of Minneapolis	MnDOT	Hennepin County
			Limited reuse opportunities for construction site. More opportunities in surrounding areas, but not practical for design size			
			Not			
			Brings issues with property owners and continuing effectiveness Not feasible			
			Will be installed where possible within project site Implemented when possible			
			Corridor already urbanized as residential and highway Not feasible			
Swale should be relatively flat to promote infiltration		Due to limitations of right-of-way throughout the corridor, treating storm water runoff in ditches is not a viable option	Very Lov			
		10-25 acre drainage area	Not feasible			
Small, isloated paved surface (0.25-2.5 ac)						
Sites with substantial debris		Not designed as a stand-alone BMP				
In median, roadway setback						
		Flow must be sheet flow to be effective				

I-35W Corridor Drainage Study
Stormwater BMP Master List
HENNC 1113114
Updated:10.10.13

Promotes		BMP	Goal(s) Met	Description	Pollution Removal	Pros	Cons
		Gutter Filter	Water Quality	Precast gutter vaults, RO treated rapidly by filtering through gravel and filter medium, like sand. Peak discharge reduced Layer of gravel, sand, void space for debris, and underdrain in basin	[3]TSS	Easy to add to urban areas, especially during street construction No longitudinal gradient limit	No detention or retention storage Cleanouts required O&M to avoid clogging
		Better Site Design	Rate Control Water Quality Volume Control	Preserving natural areas Natural area conservation Site reforestation Stream and shoreline buffers Open space design Disconnecting and distributing runoff Soil compost amendments Disconnection of surface impervious cover Rooftop disconnection Grass channels Stormwater landscaping Narrower streets Reducing impervious cover in site design		All practices can reduce stormwater runoff and pollutants Can reduce the size and cost of stormwater conveyance system and stormwater management practices	
		Surface Sand Filter	Water Quality	Filtration Basin with Sand/Compost Soil Mixture Underdrain system collects treated storm water and discharges it offsite	[3]TSS TP-	Small footprint compared to drainage area Good for sites with limited open space No pumps needed if sufficient hydraulic head Underdrain can prevent freezing	Not significant storage No impact of peak discharge flow rate Not effective during winter months Some filter medias freeze in winter and should be shut down O&M: removal of trash, large sediment pieces on top (every 1-2 weeks), top needs to be raked quarterly, vacuum sediment from filter surface 2x per year
		Green Space					
		Organic Media Filters	Rate Control Volume Control	Peat/Sand or Compost filters $3400-$16000 per impervious acres served	[2]TSS- 90-95% TP- 50%	Cost of organic media comparable to sand media Good at removing fine particles	O&M required, differs depending on type of filtering media Org. media may add nutrients

Footnotes
a= Primary BMP — Offers best options for meeting all drainage goals (rate control, water quality, and volume control)
b= Secondary BMP — Options that help achieve drainage goals, but do not meet all three goals as stand alone treatment methods

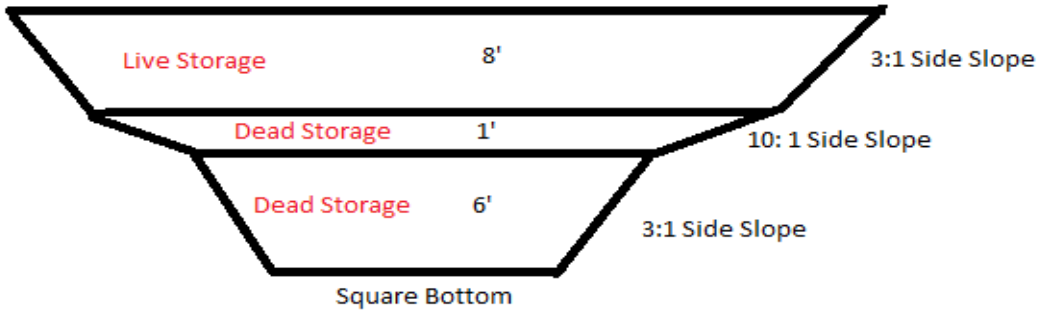
Sources
1= MN Stormwater Manual, MN
2= Stormwater Best Management Practices in and Ultra-Urban Setting, US EPA, http://environment.fhwa.dot.gov/ecosystems/ultraurb/index.asp
3= Evaluation of Best Management Practices for Highway Runoff Control, LID Design Manual, http://www.coralreef.gov/transportation/evalbmp.pdf
4= Design and Construction of Urban Stormwater Management Systems, ASCE 1992
5= National Cooperative Highway Research Program, Report 728, http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_728.pdf
6= Developing Successful Runoff Control Programs for Urbainzed Areas, US DOT, http://ntl.bts.gov/DOCS/RUNOFF.html

TABLE B14 - Stormwater BMP Master List
i-35 Corridor Drainage Study

Project Applicability				Agency Comments		
Potential Locations	Maintenance	Notes	Feasibility	City of Minneapolis	MnDOT	Hennepin County
In gutter line, next to curb or traffic varrier Roadway section must be straight						
			Not feasible			
In median or roadway setback Bottom of filter should be 2-4' above high groundwater levels						
		Underground or Surface				

Table B15 - Preliminary Basin Sizing
I-35W Corridor Drainage Study
HENNC 113114
Date: 5.14.14
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\Tables

	NPDES DESIGN STANDARDS			WMO DESIGN STANDARDS				
Area	**Change in Impervious**	**Treatment Volume (x300% to be conservative) CF**	**Pond Surface Area (ac)**	**Remaining Treatment Area**	**Remaining Impervious Area (ac)**	**Remaining Pervious Area (ac)**	**Treatment Volume (From HydroCAD) CF**	**Pond Surface Area (ac)**
94 Commons	0.27	1458	0.24	59.85	26.32	33.53	293507	2.00
Transit/Access	9.19	49626	0.70	31.43	26.67	4.76	217277	1.63
Gap	0.00	0	0.00	42.10	22.02	20.08	223681	1.66
Sum Totals	9.46	51084	0.94	133.38	75.01	58.37	734465	5.29
Totals-Calculated	9.46	51084	0.71		75.01	58.37	734465	3.94



This Page Left Blank Intentionally

Appendix C

Agency Memorandums

C1 – MnDOT Technical Memorandum Storm Water Infiltration System location guidelines for MnDOT ROW No. 14-06-ENV-01

C2 - MPCA General Permit 2013 – Stormwater Discharge

C3 - City of Minneapolis – Ordinance Chapter 54

C4 - MWMO Watershed Management Plan – Section 3

C5 - Stormwater Regulations

C6 – Hennepin County West Lake Street Improvements – Stormwater Review

C7 – MnDOT Technical Memorandum Storm Drain Design Frequency and Catch Basin Spacing No. 11-14-B-05

C8 – Crosstown-FHWA Design Standard for Tunnel

This Page Left Blank Intentionally

Minnesota Department of Transportation
Office of Materials & Road Research
1400 Gervais Avenue
Maplewood, MN 55109-2044

Office phone: 651-366-5592
Fax: 651-366-5461

Office Memorandum

TO: Andrea Hendrickson
State Hydraulic Engineer

FROM: Steven R. Henrichs
Assistant Pavement Design Engineer

CONCUR: Tim Andersen
Pavement Design Engineer

DATE: ~~7/8~~12/2/13

SUBJECT: Guidelines for Storm-Water Infiltration Location with Regard to Pavement Sections

---

Introduction

Changes to storm-water runoff standards will likely cause an increase in the design of storm-water infiltration on MnDOT projects. The Pavement Design Unit has been requested to give guidance on acceptable locations for storm-water infiltration that will not negatively affect the life of the pavement.

Effect of Water on Pavement Design

The effect of water on pavements is major concern of pavement design and maintenance. Water has a detrimental effect on both HMA and PCC pavements and the subsurface structure. It reduces the strength of base and subgrade causing the pavement to crack, deteriorates pavement cracks and joints, and it is necessary for frost heaving to occur.

Pavement crack and joint deterioration is a major cause of HMA and PCC pavement distress and roughness. Cracks and joints are routinely sealed to prevent water from entering them and into the rest of the pavement structure. New pavements are built on aggregate bases to prevent water from being drawn-up from below the HMA or PCC pavement. Research (Report No. MN/RC 2010-18) has shown that PCC joints perform best when sealed and built on drainable bases. In the past, it was allowable to construct HMA pavements directly on the subgrade, but because of poor performance HMA pavements are now always built on aggregate. To improve drainage, often edge drains are installed to drain the base and subgrade.

The reduction of the strength of the base and subgrade from water is the reason roads in Minnesota have a spring load restriction. Melting snow and ice saturates the pavements subsurface ~~and is~~and is trapped by frost that has not yet thawed. This results in reduced strength and an increase in pavement distresses. Many roads have the maximum allowable load restricted during this period to reduce distress unless the roadway was built thicker to handle normal maximum loads.

MnPAVE can be used to model the effects of a saturated pavement section. MnPAVE is the program that MnDOT uses to design HMA pavements. A typical MnPAVE pavement design uses a reduced strength for the base and subgrade during the spring thaw period to model their temporary saturated condition. Permanently saturated base and subgrade may be modeled by applying reduced strengths to the base and subgrade for the rest of the year. In the attached example, a typical HMA pavement design has a fatigue life of 25 years; but with the base and subgrade modeled as saturated in the spring, summer, and fall (winter is assumed to be frozen) the fatigue life was only 8 years.

Differential frost heave is another cause of pavement distress and roughness. Frost heave is caused by frost lenses forming in the pavement subsurface during freezing temperatures. The requirements for frost heave to occur are freezing temperatures and a source of water. Freezing temperatures can't be prevented and the pavement structure and subgrade will freeze to a certain depth, depending on winter temperatures. But water can be drained out and be prevented from entering the pavement section by using granular materials. To minimize differential frost heaving, it is MnDOT's policy to require a minimum of a 30" or 36" thick pavement section (depending on traffic). This thickness is based on ½ the expected frost depth as recommended by the Army Corps of Engineers (Engineering Manual No. 1110-3-138). The pavement section thickness includes any HMA or PCC pavement and the layers of granular material under it. The intention is that the granular material will provide support when the granular is in a saturated condition, allow water to escape from the pavement structure, and prevent water from being drawn up from the subgrade through capillary action. Additionally, the-12" below the granular material is typically prepared by being blended; any silt is removed and then re-compacted. In total, the depth of the pavement section that is designed to resist frost is typically 42" to 48".

In some circumstances, the pavement structure may be even deeper than the required minimum depth because of substandard subgrade materials. This may require replacement of the substandard material or building a thicker pavement section. Substandard subgrade may have unacceptably high organic content, low strength, or a high moisture content. This substandard roadway material will make compaction difficult for layers above it, not allow moisture to escape the base layers, and contribute to frost heave. Drains are often used in these areas.

Guidelines for Location of Infiltration with Regard to Pavement Sections

On state highways, no water should be introduced into any area that may be a source of water for the base, sub-base, ~~and subgrade~~or existing soil above the groundwater table. In rural cross-sections, this area extends from PI to PI and downward and outward at 1 to 2 (Vertical to Horizontal) slopes (**see Figure 1**) to the top of the groundwater table. For urban cross-sections, the width of this area is 12' beyond the back-side of the curb to the depth of the base and subbase, and from the back of the curb down to the top of the groundwater table (**see Figure 2**). Infiltration may be allowed within 1' of the back of the curb if an impermeable barrier is used to protect the base, sub-base, and subgrade (**see Figure 2**).

Non-highway pavements, such as sidewalks, driveways, parking lots, utility roads, and some low-speed low-volume city streets may be designed with infiltration under ~~there~~ their structure. A minimum of 6" of aggregate material should be placed under the pavement and above any

infiltration. This would act to drain the pavement material and keep moisture from being introduced to the pavement from below. It would not act to reduce frost heaving and would have a minimal effect on loss of pavement section strength from saturation.

The previous guidelines only address concerns related to the pavement section. There may be additional considerations related to slope stability, maintenance, and other factors that are not within the scope of this document.

Figure 1-Rural Roadway Section

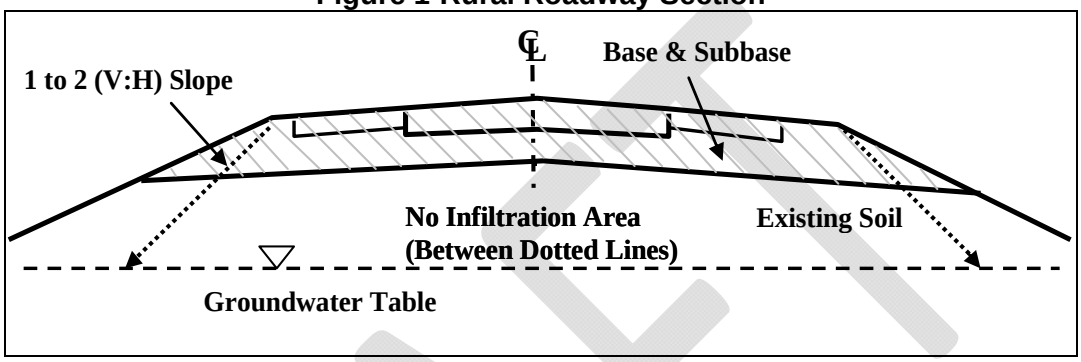
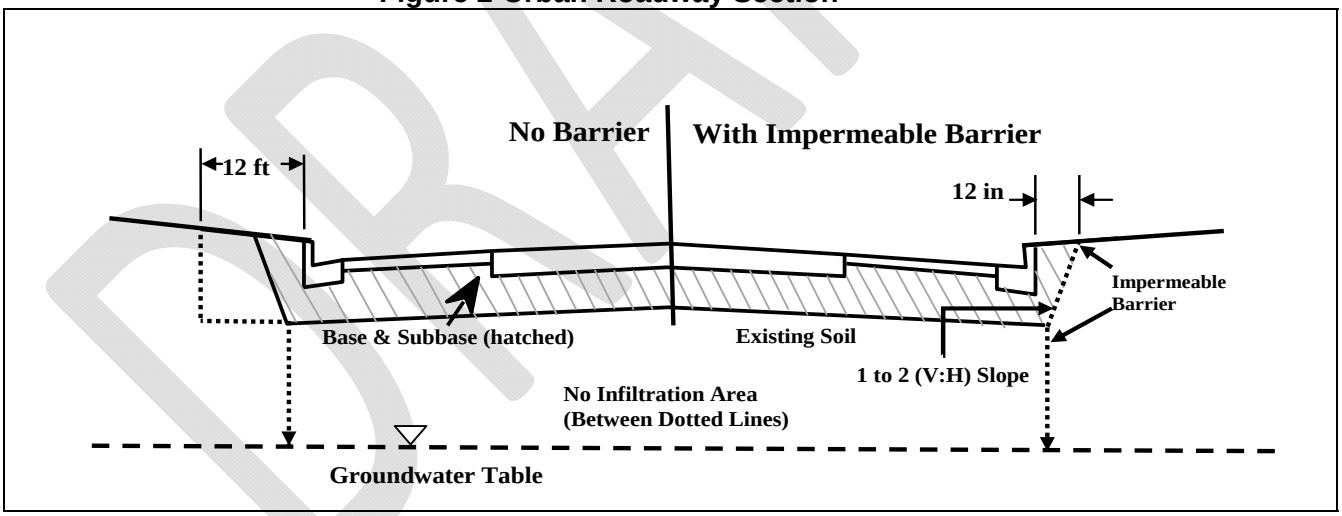
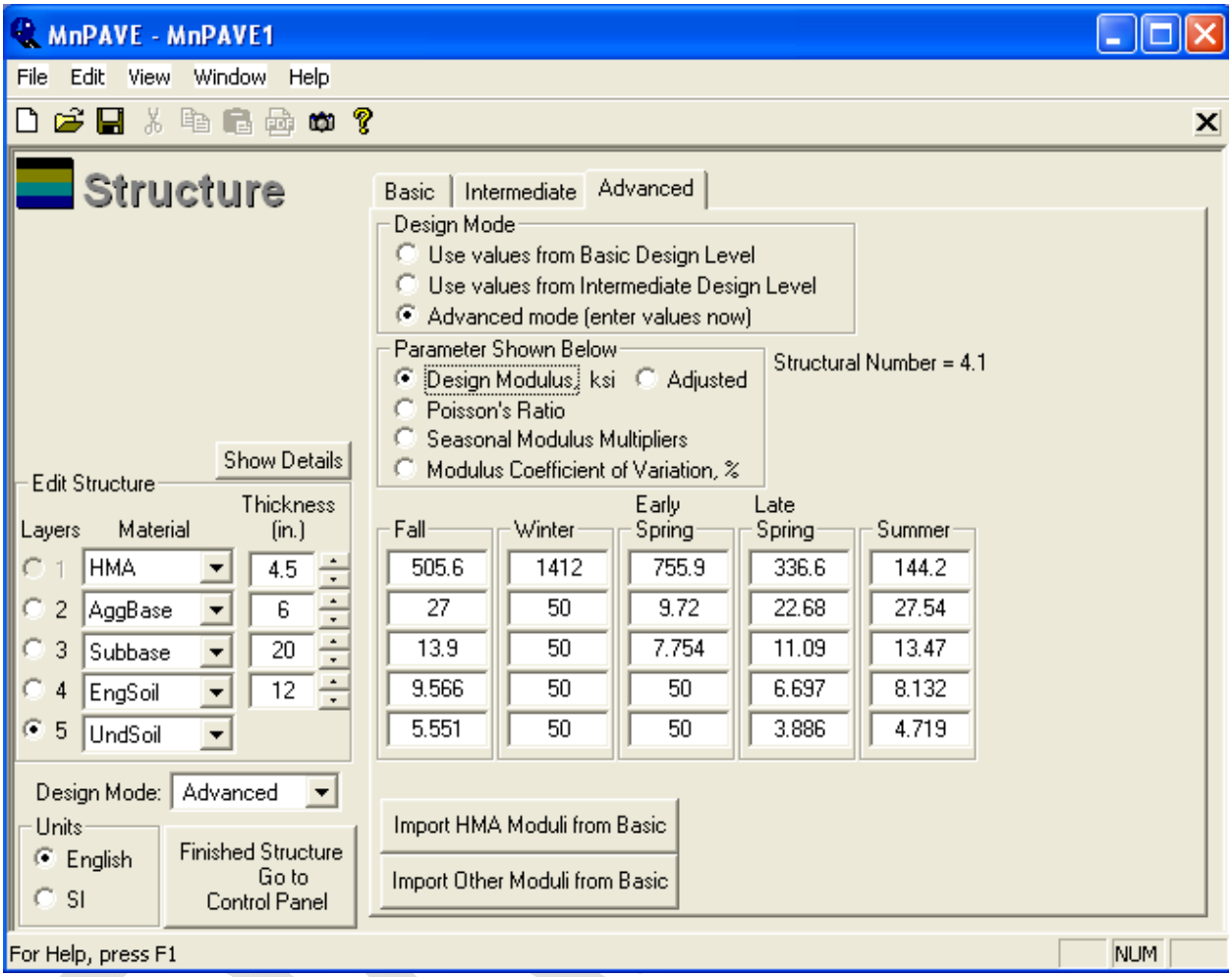


Figure 2-Urban Roadway Section



Attached:
MnPAVE Design – Usual with Spring Thaw (1A & 1B)
MnPAVE Design – Reduced Strength for Spring, Summer, & Fall (2A & 2B)

Attachment 1A - MnPAVE Moduli with Spring Thaw



MnPAVE Design Summary

MnPAVE 6.202 Simulation Input File: MnPAVE1

Confidence and Reliability do not necessarily agree. All layer values are reduced based on Confidence.
Monte Carlo Reliability randomly selects values for each layer. Use Reliability for final design.

Preliminary Life Estimate		20-Year Reliability	
Fatigue	Rutting	Fatigue	Rutting
25 years	36 years	95.8%	99.2%

Project Information

District	County	City
3	Crow Wing	

Project Number	Route	Reference Post
		from to

Letting Date	Construction Type
06/25/13	

Designer	Soils Engineer

Climate Information

Season Mode	Location
Days	46° 14' Latitude, 94° 20' Longitude

Structural Information (Design Level: Advanced)

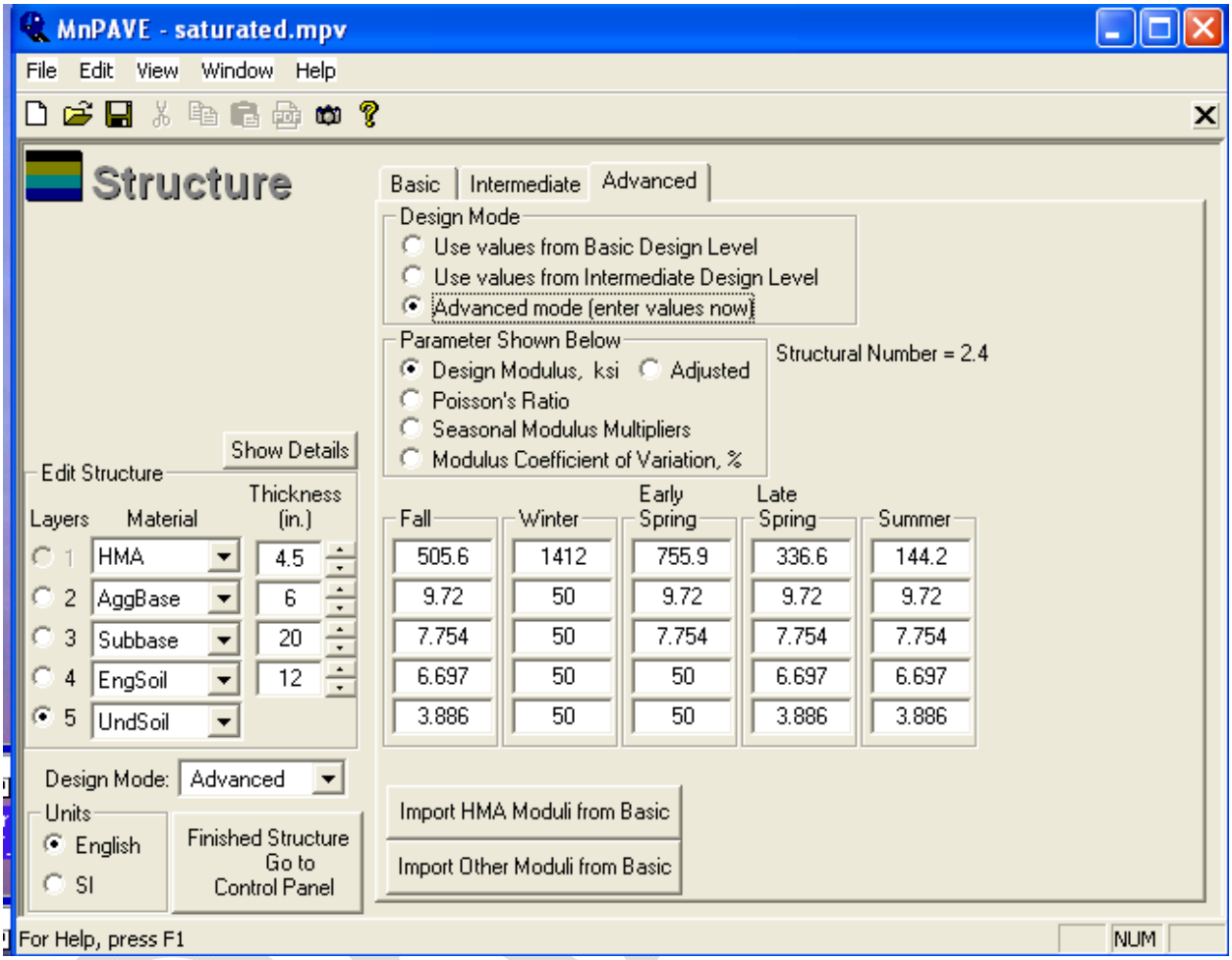
Layer	Type	Subtype	Height (in.)
1	Hot-Mix Asphalt	User Defined	4.50
2	Aggregate Base	User Defined	6.00
3	Aggregate Subbase	User Defined	20.00
4	Engineered Soil	User Defined	12.00
5	Undisturbed Soil	User Defined	

Traffic Information

Load Type	Total Repetitions
ESALs	2,000,000

Notes
baseline

Attachment 2A - MnPAVE Moduli with Saturated Condition



MnPAVE Design Summary

MnPAVE 6.202 Simulation Input File: saturated.mpv

Confidence and Reliability do not necessarily agree. All layer values are reduced based on Confidence.
Monte Carlo Reliability randomly selects values for each layer. Use Reliability for final design.

Preliminary Life Estimate		20-Year Reliability	
Fatigue	Rutting	Fatigue	Rutting
8 years	22 years	8.1%	88.4%

Project Information

District	County	City
3	Crow Wing	

Project Number	Route	Reference Post
		from to

Letting Date	Construction Type
06/25/13	

Designer	Soils Engineer

Climate Information

Season Mode	Location
Days	46° 14' Latitude, 94° 20' Longitude

Structural Information (Design Level: Advanced)

Layer	Type	Subtype	Height (in.)
1	Hot-Mix Asphalt	User Defined	4.50
2	Aggregate Base	User Defined	6.00
3	Aggregate Subbase	User Defined	20.00
4	Engineered Soil	User Defined	12.00
5	Undisturbed Soil	User Defined	

Traffic Information

Load Type	Total Repetitions
ESALs	2,000,000

Notes
saturated

GENERAL PERMIT
AUTHORIZATION TO DISCHARGE
STORMWATER ASSOCIATED WITH CONSTRUCTION ACTIVITY
UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM/
STATE DISPOSAL SYSTEM PROGRAM

ISSUANCE DATE: August 1, 2013 **EXPIRATION DATE: August 1, 2018**

This permit is issued in compliance with the provisions of the Clean Water Act, as amended, (33 U.S.C. 1251 et seq.), 40 Code of Federal Regulations (CFR) 122, 123, 124,and 450 as amended; Minnesota Statute chapters 115 and 116, as amended, and Minn. R. chs. 7001, 7050, 7060 and 7090.

This permit regulates discharges associated with **stormwater** affected by **construction activity** to **waters of the state** of Minnesota. This permit covers the **stormwater** discharges identified in Part I.A. of this permit. The limitations on permit coverage are identified in Part I.B. of this permit.

Minn. R. 7090.2040 requires **owner(s)** of a **construction activity** to complete a **Stormwater Pollution Prevention Plan (SWPPP)** prior to submitting an application for this permit and prior to conducting any **construction activity**. No person shall commence **construction activity** covered by Part I.A. until permit coverage under this permit is effective or, if applicable, until the Minnesota Pollution Control Agency (MPCA) has issued an individual **National Pollutant Discharge Elimination System (NPDES)**/State Disposal System (SDS) Construction **Stormwater** (CSW) Permit for the **project**.

Unless notified by the MPCA to the contrary, applicants who submit a complete and accurate application (including permit fee) in accordance with the requirements of this permit are authorized to discharge **stormwater** associated with construction activity under the terms and conditions of this permit as described in Part II.B.

Signature: _____

John Linc Stine
Commissioner

If you have questions on this permit, including the specific permit requirements, permit reporting or permit compliance status, please contact the appropriate MPCA offices. Note that **bolded** words throughout the permit are defined in Appendix B.

Minnesota Pollution Control Agency
Municipal Division
Construction Stormwater Program
520 Lafayette Road North
St. Paul, MN 55155-4194
Telephone: 651-296-6300
Toll free in MN: 800-657-3864

TABLE OF CONTENTS

Page

I. PERMIT COVERAGE AND LIMITATIONS 3

A. Permit Coverage 3
B. Limitations of Coverage 3

II. SUBMITTING THE APPLICATION 4

A. Prerequisite for Submitting a Permit Application 4
B. Application and Duration of Coverage 5
C. Termination of Coverage 6

III. STORMWATER DISCHARGE DESIGN REQUIREMENTS 7

A. Stormwater Pollution Prevention Plan Content 7
B. SWPPP Amendments 10
C. Temporary Sediment Basins 11
D. Permanent Stormwater Management System 12
E. Record Retention 15
F. Training Requirements 16

IV. CONSTRUCTION ACTIVITY REQUIREMENTS 16

A. Stormwater Pollution Prevention Plan 16
B. Erosion Prevention Practices 17
C. Sediment Control Practices 18
D. Dewatering and Basin Draining 20
E. Inspections and Maintenance 20
F. Pollution Prevention Management Measures 22
G. Final Stabilization 24

V. GENERAL PROVISIONS 24

A. Applicability Criteria 24
B. Record Availability 25
C. Prohibitions 25
D. Transfer of Ownership or Control 25
E. Civil and Criminal Liability 25
F. Severability 25
G. NPDES/SDS Rule Standard General -Conditions 26
H. Inspection and Entry 26

APPENDIX A 26

APPENDIX B - DEFINITIONS 31

PART I. PERMIT COVERAGE AND LIMITATIONS

I.A. PERMIT COVERAGE

1. This permit is required for **construction activity** that results in land disturbance of equal to or greater than one acre or a **common plan of development or sale** that disturbs greater than one acre, and authorizes, subject to the terms and conditions of this permit, the discharge of **stormwater** associated with **construction activity.**

   Construction activity does not include a disturbance to the land of less than five (5) acres for the purpose of routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of the facility. Pavement rehabilitation that does not disturb the underlying soils (e.g., mill and overlay **projects**) is not considered construction activity.

2. This permit covers all areas of the State of Minnesota.

3. Coverage under this permit is not required when all stormwater from **construction activity** is routed directly to and treated by a "treatment works", as defined in Minn. Stat. § 115.01, subd. 21, that is operated under an individual **NPDES**/SDS permit with a Total Suspended Solids effluent limit for all treated runoff.

4. Previously Permitted Ongoing **Projects: Permittee(s)** of ongoing **projects** covered initially under the previous MPCA-issued **NPDES**/SDS Construction Stormwater General Permit (issuance date August 1, 2008) are granted coverage under this reissued permit.

   a. The **Permittee(s)** of those ongoing **projects** shall amend the **SWPPP** for the **project** to meet the requirements of this reissued permit no later than 18 months after the issuance date of this reissued permit if the termination-of-coverage requirements in Part II.C. will not be met within 18 months of the issuance date of this reissued permit and shall thereafter comply with this permit. However, additional permanent treatment required in this reissued permit is not required for previously permitted **projects**.

   b. If the previously permitted ongoing **project** will meet the termination-of-coverage requirements in Part II.C. within 18 months of the issuance date of this reissued permit, the **Permittee(s)** shall comply with the 2008 construction general permit until the **project** is complete and a **Notice of Termination (NOT)** consistent with Part II.C. of this reissued permit is submitted.

   c. If a previously permitted ongoing **project** will not be able to meet the terms and conditions of this reissued permit (other than the additional permanent treatment requirement) and will continue longer than 18 months after the issuance date of this permit, the **Permittee(s)** shall apply for an individual permit in accordance with Minn. R. ch. 7001.

I.B. LIMITATIONS OF COVERAGE

This permit does not authorize discharges related to the following activities:

1. Discharges or releases that are not **stormwater** (except those non-**stormwater** discharges

authorized under Part IV.D.).

2. The placement of fill into **waters of the state** requiring local, state or federal authorizations (such as U.S. Army Corps of Engineers Section 404 permits, Minnesota Department of Natural Resources Public Waters Work Permits or Local Governmental Unit Wetland Conservation Act replacement plans or determinations).

3. Discharges associated with industrial activity except for **construction activity**. Discharges associated with industrial activity may need to obtain coverage under a separate NPDES/SDS permit once day-to-day operational activities commence even if construction is ongoing.

4. Discharges from non-point source agricultural and silvicultural activities excluded from **NPDES** permit requirements under 40 CFR pt. 122.3(e).

5. Discharges to the waters identified below unless the requirements of Appendix A are complied with:

   a. Discharges into outstanding resource value waters as listed in Minn. R. 7050.0180, subp. 3, 4, 5, 6, 6a and 6b.

   b. Discharges into trout waters as listed in Minn. R. 6264.0050, subp. 2 and 4.

   c. Discharges into **wetlands** as defined in Minn. R. 7050.0186 subd.1a.B.

   d. Discharges from **projects** that have not completed applicable Environmental Review requirements under state or federal laws.

   e. Discharges that adversely impact or contribute to adverse impacts on a state or federally listed endangered or threatened species or adversely modify a designated critical habitat.

   f. Discharges that adversely affect properties listed or eligible for listing in the National Register of Historic Places or affecting known or discovered archeological sites.

6. Discharges to waters identified as impaired pursuant to section 303(d) of the federal Clean Water Act (33 U.S.C. § 303(d)) where the identified pollutant(s) or stressor(s) are phosphorus (nutrient eutrophication biological indicators), turbidity, dissolved oxygen, or biotic impairment (fish bioassessment, aquatic plant bioassessment and aquatic macroinvertebrate bioassessment), and with or without a U.S. Environmental Protection Agency (USEPA) approved Total Maximum Daily Load (TMDL) for any of these identified pollutant(s) or stressor(s), unless the applicable requirements of Part III.A.8. are met.

PART II. SUBMITTING THE APPLICATION

II.A. PREREQUISITE FOR SUBMITTING A PERMIT APPLICATION

The **owner** must develop an accurate and complete **SWPPP** in accordance with Part III. (Stormwater Discharge Design Requirements) of this permit prior to submitting the application for coverage. The **SWPPP** is not required to be submitted to the MPCA (unless the **project** size is 50 acres or more and will discharge to certain waters as described in Part II.B.1.b.) but is to be retained by the **owner** in

accordance with Part III.E. (Record Retention). The **owner's** failure to prepare an accurate and complete **SWPPP** prior to submitting the application is grounds for MPCA to revoke the permit.

II.B. APPLICATION AND DURATION OF COVERAGE

1. Application Required.

   a. The **owner** and **operator** shall submit a complete and accurate on-line application form with the appropriate fee to the MPCA for each **project** that disturbs one (1) or more acres of land or for a **common plan of development or sale** that will ultimately disturb one (1) or more acres. If the applicant is not able to apply on-line, contact the MPCA for technical assistance or a waiver.

   b. For certain **projects** or **common plans of development or sale** disturbing 50 acres or more, the application must be submitted at least 30 days before the start of **construction activity**. This requirement pertains to **projects** that have a discharge point on the **project** that is within one mile (**aerial radius measurement**) of, and flows to, a special water listed in Appendix A, Part B. or waters listed as impaired under section 303(d) of the federal Clean Water Act (see the MPCA's website) where the identified pollutant(s) or stressor(s) are phosphorus (nutrient eutrophication biological indicators), turbidity, dissolved oxygen, or biotic impairment (fish bioassessment, aquatic plant bioassessment and aquatic macroinvertebrate bioassessment). Applicants of **projects** listed in this part must submit a complete and accurate application form and **SWPPP** including all calculations for the Permanent **Stormwater** Management System (see Parts III.A.-D.).

2. All persons meeting the definition of **owner** and **operator** are **Permittees** and must be listed on the application. The **owner** is responsible for compliance with all terms and conditions of this permit. The **operator** is responsible for compliance with Parts II.B, II.C, III.B-F, IV, V, and applicable **construction activity** requirements found in Appendix A, Part C. of this permit and is jointly responsible with the **owner** for compliance with those portions of the permit.

3. Permit Coverage Effective Date: The commencement of any **construction activity** (e.g., land disturbing activities) covered under Part I.A. of this permit is prohibited until permit coverage under this permit is effective.

   a. For **projects** listed in Part II.B.1.a. permit coverage will become effective <u>seven (7) calendar days</u> after the electronic submittal date or the postmarked date of a complete application form.

   b. For **projects** listed in Part II.B.1.b. permit coverage will become effective 30 calendar days after the electronic submittal date, the postmarked date or MPCA date stamp (whichever is first) of the complete application. For incomplete applications (e.g., lack of fees or signature) or incomplete **SWPPPs** (e.g., missing calculations, **Best Management Practice (BMP)** specifications, estimated quantities of the **BMPs,** or timing of **BMP** installation narrative), the permit becomes effective 30 calendar days after all required information is submitted.

4. Coverage Notification: **Permittee(s)** will be notified of coverage in a manner as determined by the **Commissioner** (e.g., e-mail, online notification or letter).

5. Change of Coverage: For construction **projects** where the **owner** or **operator** changes, (e.g., an original developer sells portions of the property to various homebuilders or sells the entire site to a new **owner**) the current **owner** and the new **owner** or **operato**r shall submit a complete permit modification on a form provided by the **Commissioner**. The form must be submitted prior to the new **owne**r or **operator** commencing **construction activity** on site or in no case later than 30 days after taking ownership of the property. The **owner** shall provide a **SWPPP** to the new **owner** and **operator** that specifically addresses the remaining **construction activity**.

II.C. TERMINATION OF COVERAGE

1. Termination of coverage when construction is complete: All **Permittee(s)** must submit a **Notice of Termination (NOT)** to the MPCA on a form provided by the **Commissioner** within 30 days after all activities required for **Final Stabilization** (see Part IV.G.) are complete. The **Permittee(s)'** coverage under this permit terminates at midnight on the submission date of the **NOT**.

2. Termination of coverage when transfer of ownership occurs: All **Permittee(s)** must submit a **NOT** on a form provided by the **Commissioner** within 30 days after selling or otherwise legally transferring the entire site, including permit responsibility for roads (e.g., street sweeping) and **stormwater** infrastructure final clean out, or transferring portions of a site to another party. The **Permittee(s)'** coverage under this permit terminates at midnight on the submission date of the **NOT**.

3. **Permittee(s)** may terminate permit coverage prior to completion of all **construction activity** if all of the following conditions are met. After the permit is terminated under this Part, if there is any subsequent development on the remaining portions of the site where **construction activity** was not complete, new permit coverage must be obtained if the subsequent development itself or as part of the remaining **common plan of development or sale** will result in land disturbing activities of one (1) or more acres in size.

   a. **Construction activity** has ceased for at least 90 days.

   b. At least 90 percent (by area) of all originally proposed **construction activity** has been completed and **permanent cover** established on those areas.

   c. On areas where **construction activity** is not complete, **permanent cover** has been established.

   d. The site is in compliance with Part IV.G.2. and Part IV.G.3. and where applicable, Part IV.G.4. or Part IV.G.5.

4. **Permittee(s)** may terminate coverage upon approval by the MPCA if information is submitted to the MPCA documenting that termination is appropriate because the project is cancelled.

PART III. STORMWATER DISCHARGE DESIGN REQUIREMENTS

III.A. STORMWATER POLLUTION PREVENTION PLAN CONTENT

The **owner** must develop a **Stormwater Pollution Prevention Plan** (**SWPPP).** The **SWPPP** shall be

completed prior to submitting any permit application and prior to conducting any **construction activity** by any required **Permittee(s)**. For **stormwater** discharges from **construction activity** where the **owner** or **operator** changes, the new **owner** or **operator** can implement the original **SWPPP** created for the **project**, modify the original **SWPPP**, or develop and implement their own **SWPPP**. **Permittee(s)** shall ensure either directly or through coordination with other **Permittee(s)** that their **SWPPP** meets all terms and conditions of this permit and that their activities do not render another party's **erosion prevention** and **sediment control BMPs** ineffective. The **SWPPP** must include the following:

1. A description of the **construction activity:** The description must be a combination of narrative, plan sheets, and (if appropriate) standard detail sheets that address the foreseeable conditions, at any stage in the construction or post construction activities. The **SWPPP** must identify the potential for discharge of sediment and/or other potential pollutants from the site. The **SWPPP** must propose **erosion prevention and sediment control BMPs** to control the discharge of sediment and/or other potential pollutants from the site.

2. Knowledgeable person/chain of responsibility: As part of the **SWPPP,** the **owner** must identify a person knowledgeable and experienced in the application of **erosion prevention** and **sediment control BMPs** who will oversee the implementation of the **SWPPP**, and the installation, inspection and maintenance of the **erosion prevention** and **sediment control BMPs** (see Part III.F.1.) before and during construction. The **owner** must identify in the **SWPPP** who will have the responsibility for long-term operation and maintenance of the Permanent **Stormwater** Management System (see Part III.D.). The **owner** shall include in the **SWPPP** a chain of responsibility with all **operators** on the site, or if not known, the title or position of the responsible party, to ensure that the **SWPPP** will be implemented and stay in effect until the construction **project** is complete, the entire site has undergone **Final Stabilization**, and an **NOT** has been submitted to the MPCA. Once the identity of the responsible party is known, the SWPPP must be amended to include this information.

3. Training documentation: The **Permittee(s)** shall ensure the individuals identified in Part III.F. have been trained in accordance with this Permit's training requirements. The **Permittee(s)** shall ensure the training is recorded in or with the **SWPPP** before the start of construction or as soon as the personnel for the **project** have been determined. Documentation shall include:

    a. Names of the personnel associated with this **project** that are required to be trained per Part III.F.1. of this permit.

    b. Dates of training and name of instructor(s) and entity providing training.

    c. Content of training course or workshop including the number of hours of training.

4. Designs, calculations, and narrative: The **SWPPP** must incorporate the requirements of Part III (**Stormwater** Discharge Design Requirements) including calculations, Part IV (**Construction Activity** Requirements) and Appendix A for the **project**. A narrative describing the timing for installation of all **erosion prevention** and **sediment control BMPs** and permanent **stormwater** management systems required in Part III, Part IV and Appendix A must also be included in the **SWPPP**.

5. **SWPPP** components: The **SWPPP** requirements must be incorporated into the **project's** final

plans and specifications and/or **project** documentation, as appropriate, and must include:

a. Location and type of all temporary and permanent **erosion prevention** and **sediment control BMPs** along with procedures to be used to establish additional temporary **BMPs** as necessary for the site conditions during construction. **Standard details** and/or specifications for the **BMPs** used on the **project** must be included in the final plans and specifications for the **project**.

b. Quantities: Estimated preliminary quantities tabulation anticipated at the start of the **project** for the life of the **project** must be included for all **erosion prevention** and **sediment control BMPs** in the **SWPPP** (e.g., linear feet of silt fence or ft^2 of erosion control blanket).

c. Impervious surface: The number of acres of **impervious surface** for both pre- and post-construction must be specified.

d. Site map: A site map with existing and final grades, including dividing lines and direction of flow for all pre-and post-construction **stormwater** runoff drainage areas located within the **project** limits must be included. The site map must indicate the areas of **steep slopes**. The site map must also include **impervious surfaces,** soil types and locations of potential pollutant-generating activities as identified in Part IV.F.

e. Locations of areas not to be disturbed: Buffer zones, as required for temporary **BMPs** during construction in Part IV.C.9., or if required as permanent **BMPs** in Appendix A, Part C.3., must be described and identified on plan sheets or **project** maps in the **SWPPP**.

f. Construction phasing: Location of areas where construction will be phased to minimize duration of exposed soil areas must be described.

g. Maps of surface waters and wetlands: The **SWPPP** must include a map of all **surface waters,** existing **wetlands**, and **stormwater** ponds or basins which can be identified on maps such as United States Geological Survey 7.5 minute quadrangle maps, the National Wetland Inventory map or equivalent maps within one mile (**aerial radius measurement**) from the **project** boundaries that will receive **stormwater** from the construction site, during or after construction. Where **surface waters** receiving **stormwater** associated with **construction activity** will not fit on the plan sheet, they must be identified with an arrow, indicating both direction and distance to the **surface water**. The **SWPPP** must identify if the **surface water** is a special or impaired water. The site map must also show **construction activity** areas that are adjacent to and drain to **Public Waters** for which the Department of Natural Resources has promulgated “work in water restrictions” during specified fish spawning time frames.

h. **Final stabilization:** Methods to be used for **Final Stabilization** of all exposed soil areas must be described.

i. **BMP** design factors: The **SWPPP** must account for the following factors in designing the temporary **erosion prevention** and **sediment control BMPs**:

    i. The expected amount, frequency, intensity, and duration of precipitation.

    ii. The nature of **stormwater** runoff and run-on at the site, including factors such as

expected flow from **impervious surface**s, slopes, and site drainage features.

iii. If any **stormwater** flow will be channelized at the site, the **Permitte(s)** must design **BMPs** to control both peak flowrates and total **stormwater** volume to minimize erosion at outlets and to minimize downstream channel and streambank erosion.

iv. The range of soil particle sizes expected to be present on the site.

j. Soil Management: Methods used to minimize soil compaction and preserve topsoil must be described. Minimizing soil compaction is not required where the function of a specific area of the site dictates that it be compacted.

k. Maintenance plan: For **projects** that include permanent **stormwater** treatment systems, the **SWPPP** must include a maintenance plan identifying who will be performing future maintenance of the system.

l. Chemical treatments: Any specific chemicals and the chemical treatment systems that may be used for enhancing the sedimentation process on the site, and how compliance will be achieved with the requirements in Part IV.C.10., must be described.

m. Documentation of **infeasibility**: If the **Permittee(s)** determine(s) that compliance with the requirement for temporary sediment basins (Part III.C.) is **infeasible** on the **project** site; the **Permittee(s)** must document that determination and the substitute **BMPs** in the **SWPPP**. If **Permittee(s)** cannot obtain right-of-way for the permanent stormwater management system; the **Permittee(s)** must document the infeasibility of obtaining right-of-way (Part III.D.)

6. Stormwater pollution mitigation measures identified in environmental review or other required review: The **SWPPP** must include any **stormwater** mitigation measures approved as part of a final environmental review document, endangered species review, archeological or other required local, state or federal review conducted for the **project**. For the purposes of this permit provision, mitigation measures means actions necessary to avoid, minimize, or rectify (e.g., repairing, rehabilitating, restoring), reducing, eliminating or compensating for impacts related to: (1) **stormwater** discharges associated with the **project's construction activity**; and (2) **erosion prevention**, **sediment control** and the Permanent **Stormwater** Management System for the **project**.

7. Karst areas: The **SWPPP** must identify additional or different measures necessary (e.g. impervious liner in pond bottom) to assure compliance with **surface and groundwater** standards in Minn. R. chs. 7050 and 7060 in karst areas and to ensure protection of drinking water supply management areas (see Minn. R. 4720.5100, subp. 13).

8. Impaired Waters and Total Maximum Daily Loads (TMDLs): The **SWPPP** must address the following:

   a. For **projects** that have a discharge point on the **project** that is within one mile (**aerial radius measurement**) of and which flows to an impaired water, the **Permittee(s)** must identify the impaired water(s) in the **SWPPP**, and whether or not there is a USEPA-approved TMDL for the pollutant(s) or stressor(s) identified in Appendix A, Part B.10. Unless otherwise notified by the MPCA in writing, the **Permittee(s)'** identification of impaired waters must be based

on the most recent USEPA approved section 303(d) Clean Water Act list of impaired waters and USEPA approved TMDLs at the time a complete permit application is submitted. The **Permittee(s)'** identification must include those TMDLs, applicable to the **project's stormwater** discharge, that were approved at any time prior to permit application submittal and are still in effect.

b. If the TMDL identifies specific implementation activities regarding construction **stormwater** that would apply to the site discharges, the **Permittee(s)** must include the **BMPs** identified in the TMDL and any other specific construction **stormwater** related implementation activities identified in the TMDL.

III.B. SWPPP AMENDMENTS

The **Permittee(s)** must amend the **SWPPP** as necessary to include additional requirements, such as additional or modified **BMPs** that are designed to correct problems identified or address situations whenever:

1. There is a change in design, construction, operation, maintenance, weather or seasonal conditions that has a significant effect on the discharge of pollutants to **surface waters** or **underground waters**.

2. Inspections or investigations by site **owner** or **operators**, USEPA or MPCA officials indicate the **SWPPP** is not effective in eliminating or significantly minimizing the discharge of pollutants to **surface waters** or **underground waters** or that the discharges are causing water quality standard exceedances (e.g., nuisance conditions as defined in Minn. R. 7050.0210, subp. 2).

3. The **SWPPP** is not achieving the general objectives of minimizing pollutants in **stormwater** discharges associated with **construction activity**, or the **SWPPP** is not consistent with the terms and conditions of this permit.

4. At any time after permit coverage is effective, the MPCA may determine that the **project's stormwater** discharges may cause, have reasonable potential to cause, or contribute to non-attainment of any applicable water quality standard, or that the **SWPPP** does not incorporate the applicable requirements in Part III.A.8., (Impaired Waters and TMDLs). If a water quality standard changes during the term of this permit, the MPCA will make a determination as to whether a modification of the SWPPP is necessary to address the new standard. If the MPCA makes such determination(s) or any of the determinations in Parts III.B.1.-3., the MPCA will notify the **Permittee(s)** in writing. In response, the **Permittee(s)** must amend the **SWPPP** to address the identified concerns and submit information requested by the MPCA, which may include an individual permit application. If the MPCA's written notification requires a response, failure to respond within the specified timeframe constitutes a permit violation.

III.C. TEMPORARY SEDIMENT BASINS

Where ten (10) or more acres of disturbed soil drain to a common location, the **Permittee(s)** must provide a temporary sediment basin to provide treatment to the runoff before it leaves the construction site or enters **surface waters**. A temporary sediment basin may be converted to a permanent basin after construction is complete. The temporary basin is no longer required when

permanent cover has reduced the acreage of disturbed soil to less than ten (10) acres draining to a common location. The **Permittee(s)** is/are encouraged, but not required, to install temporary sediment basins where appropriate in areas with **steep slopes** or highly erodible soils even if less than ten (10) acres drains to one area. The basins must be designed and constructed according to the following requirements:

1. The basins must provide live storage for a calculated volume of runoff from a two (2)-year, 24-hour storm from each acre drained to the basin, except that in no case shall the basin provide less than 1,800 cubic feet of live storage from each acre drained to the basin.

2. Where the calculation in Part III.C.1. has not been performed, a temporary sediment basin providing 3,600 cubic feet of live storage per acre drained to the basin shall be provided for the entire drainage area of the temporary basin.

3. Temporary basin outlets must be designed to prevent short-circuiting and the discharge of floating debris. The basin must be designed with the ability to allow complete basin drawdown for maintenance activities, and must include a **stabilized** emergency overflow to prevent failure of pond integrity. The outlet structure must be designed to withdraw water from the surface in order to minimize the discharge of pollutants, except that the use of a surface withdrawal mechanism for discharge of the basin may be temporarily suspended during frozen conditions. **Energy dissipation** must be provided for the basin outlet (see Part IV.B.5.).

4. Sediment Basins must be situated outside of surface waters and any buffer zone required under Appendix A.C.3, and must be designed to avoid draining water from **wetlands** unless the impact to the **wetland** is in compliance with the requirements of Appendix A, Part D.

5. The temporary basins must be constructed and made operational prior to 10 or more acres of disturbed soil draining to a common location.

6. Where a temporary sediment basin meeting the requirements of this part is **infeasible**, equivalent **sediment controls** such as smaller sediment basins, and/or sediment traps, silt fences, vegetative buffer strips, or any appropriate combination of measures are required for all down-slope boundaries of the construction area and for side-slope boundaries as dictated by individual site conditions. In determining whether installing a sediment basin is **infeasible**, the **Permittee(s)** must consider public safety and may consider factors such as site soils, slope, and available area on site. This determination of **infeasibility** must be documented in the **SWPPP** per Part III.A.5.m.

III.D. PERMANENT STORMWATER MANAGEMENT SYSTEM

The **Permittee(s)** shall design the **project** so that all **stormwater** discharged from the **project** during and after **construction activities** does not cause a violation of state water quality standards, including nuisance conditions, erosion in receiving channels or on downslope properties, or a significant adverse impact to **wetlands** caused by inundation or decrease of flow.

The **Permittee(s)** shall construct a permanent stormwater management system meeting the requirements of this Part, or if the **project** is located in a jurisdiction subject to a **NPDES/**SDS Municipal Separate Storm Sewer System (MS4) permit and that permit has established permanent treatment requirements that include volume reduction, the **Permittee(s)** can comply with the

permanent treatment requirements established under the MS4 permit in lieu of the permanent treatment requirements of this permit.

Where a **project's** ultimate development replaces vegetation and/or other pervious surfaces with one (1) or more acres of cumulative **impervious surface**, the **Permittee(s)** must design the **project** so that the **water quality volume** of one (1) inch of runoff from the new **impervious surfaces** created by the **project** is retained on site (i.e. infiltration or other volume reduction practices) and not discharged to a **surface water**. For purposes of this part, **surface waters** does not include man-made drainage systems that convey **stormwater** to a compliant permanent **stormwater** management system.

For those **projects** where infiltration is prohibited (see Part III.D.1.j.), the **Permittee(s)** shall consider other methods of volume reduction and the **water quality volume** (or remainder of the **water quality volume** if some volume reduction is achieved) must be treated by a wet sedimentation basin, filtration system, regional ponding or equivalent methods prior to the discharge of **stormwater** to **surface waters**.

Where the proximity to bedrock precludes the installation of any of the permanent **stormwater** management practices outlined in Part III.D., other treatment, such as grassed swales, filtration systems, smaller ponds, or grit chambers, is required prior to the discharge of **stormwater** to **surface waters**.

For work on linear **projects** with lack of right-of-way where the **Permittee(s)** cannot obtain an easement or other permission for property needed to install treatment systems capable of treating the entire **water quality volume** on site, the **Permittee(s)** must maximize the **water quality volume** that can be treated prior to discharge to **surface waters**. Treatment can be provided through other methods or combination of methods such as grassed swales, filtration systems, smaller ponds, or grit chambers, prior to discharge to **surface waters**. A reasonable attempt must be made to obtain right-of-way during the **project** planning process. Documentation of these attempts must be in the **SWPPP** per Part III.A.5.m. in the section addressing **infeasibility**.

When constructing any of the permanent **stormwater** management systems in this part, the **Permittee(s)** must incorporate the following design parameters:

1. Infiltration/Filtration

    a. Infiltration/Filtration options include but are not limited to: infiltration basins, infiltration trenches, rainwater gardens, sand filters, organic filters, bioretention areas, natural or enhanced swales, dry storage ponds with underdrain discharge, off-line retention areas, and natural depressions. Infiltration must be used only as appropriate to the site and land uses. The method selected by the **Permittee(s)** must remove settleable solids, floating materials, and oils and grease from the runoff to the maximum extent practicable before runoff enters the infiltration/filtration system. Filtration systems must be designed to remove at least 80 percent of total suspended solids. When designing the system the **Permittee(s)** must evaluate the impact of constructing an infiltration practice on existing hydrologic features (e.g., existing **wetlands**) and the system must be designed to maintain pre-existing conditions (e.g., do not breach a perched water table that is supporting a **wetland**). For a discussion of potential **stormwater** hotspots, groundwater warnings, design measures, maintenance considerations or other retention, detention, and treatment devices, see the

Minnesota Stormwater Manual found on the MPCA's website.

b. Infiltration systems must not be excavated to final grade until the contributing drainage area has been constructed and fully **stabilized** unless rigorous erosion prevention and sediment controls are provided (Part III.D.1.c.).

c. When an infiltration system is excavated to final grade (or within three (3) feet of final grade), the **Permittee(s)** must employ rigorous **erosion prevention** and **sediment controls** (e.g., diversion berms) to keep sediment and runoff completely away from the infiltration area. The area must be staked off and marked so that heavy construction vehicles or equipment will not compact the soil in the proposed infiltration area.

d. To prevent clogging of the infiltration or filtration system, the **Permittee(s)** must use a pretreatment device such as a vegetated filter strip, small sedimentation basin, or water quality inlet (e.g., grit chamber) to settle particulates before the **stormwater** discharges into the infiltration or filtration system.

e. The **Permittee(s)** must design infiltration or filtration systems that provide a **water quality volume** (calculated as an instantaneous volume) of one (1) inch of runoff (or one (1) inch minus the volume of **stormwater** treated by another system on the site) from the new impervious surfaces created by the **project**.

f. The **Permittee(s)** must design the infiltration/filtration system to discharge the **water quality volume** routed to the system through the soil surface or filter media within 48 hours or less. Additional flows that cannot be infiltrated or filtered within 48 hours must be routed to bypass the system through a **stabilized** discharge point. The **Permittee(s)** must design the infiltration system to provide a means to visually verify that the system is discharging through the soil surface or filter media within 48 hours or less.

g. The **Permittee(s)** shall employ appropriate on-site testing consistent with the recommendations found in the **Minnesota Stormwater Manual** to verify soil type and to ensure a minimum of three (3) feet of separation from the seasonally **saturated soils** (or from bedrock) and the bottom of the proposed infiltration/filtration system.

h. The **Permittee(s)** must ensure filtration systems with less than three (3) feet of separation from seasonally **saturated soils** or from bedrock are constructed with an impermeable liner.

i. The **Permittee(s)** must design adequate maintenance access (typically eight (8) feet wide).

j. Infiltration is prohibited when the infiltration system will be constructed in:

   i. Areas that receive discharges from vehicle fueling and maintenance.

   ii. Areas with less than three (3) feet of separation distance from the bottom of the infiltration system to the elevation of the seasonally **saturated soils** or the top of bedrock.

iii. Areas that receive discharges from industrial facilities which are not authorized to infiltrate industrial **stormwater** under an **NPDES/**SDS Industrial Stormwater Permit issued by the MPCA.

iv. Areas where high levels of contaminants in soil or groundwater will be mobilized by the infiltrating **stormwater.**

v. Areas of predominately Hydrologic Soil Group D (clay) soils unless allowed by a local unit of government with a current MS4 permit.

vi. Areas within 1,000 feet up-gradient, or 100 feet down-gradient of active karst features unless allowed by a local unit of government with a current MS4 permit.

vii. Areas within a Drinking Water Supply Management Area (DWSMA) as defined in Minn. R. 4720.5100, subp. 13., unless allowed by a local unit of government with a current MS4 permit.

viii. Areas where soil infiltration rates are more than 8.3 inches per hour unless soils are amended to slow the infiltration rate below 8.3 inches per hour or as allowed by a local unit of government with a current MS4 permit.

2. Wet Sedimentation Basin

a. The **Permitte(s)** must design the basin to have a permanent volume of 1,800 cubic feet of storage below the outlet pipe for each acre that drains to the basin. The basin's permanent volume must reach a minimum depth of at least three (3) feet and must have no depth greater than 10 feet. The basin must be configured such that scour or resuspension of solids is minimized.

b. The **Permittee(s)** must design basins to provide live storage for a **water quality volume** (calculated as an instantaneous volume) of one (1) inch of runoff (or one (1) inch minus the volume of **stormwater** treated by another system on the site) from the new impervious surfaces created by the **project**.

c. The **Permittee(s)** must design basin outlets such that the **water quality volume** is discharged at no more than 5.66 cubic feet per second (cfs) per acre of surface area of the pond.

d. The **Permittee(s)** must design basin outlets to prevent short-circuiting and the discharge of floating debris. Basin outlets must have **energy dissipation**.

e. The **Permittee(s)** must design the basin to include a **stabilized** emergency overflow to accommodate storm events in excess of the basin's hydraulic design.

f. The **Permittee(s)** must design adequate maintenance access (typically eight (8) feet wide).

g. The **Permittee(s)** must design sediment Basins to be situated outside of **surface waters** and any buffer zone required under Appendix A, Part C.3. and they must be designed to avoid draining water from **wetlands** unless the impact to the **wetland** is in compliance with the requirements of Appendix A, Part D.

3. Regional Ponds

   When the entire **water quality volume** cannot be retained onsite, the **Permittee(s)** can use or create regional ponds provided that they are constructed ponds, not a natural **wetland** or water body, (**wetlands** used as regional ponds must be mitigated for, see Appendix A, Part D) and designed in accordance with this permit's design requirements (Part III.D.2.) for all water from **impervious surfaces** that reach the pond. **Permittee(s)** shall not construct regional ponds in **wetlands**, regardless of their condition, quality or designation by local plans, unless the mitigative sequence in Appendix A, Part D. of this permit has been completed. There must be no significant degradation of the waterways between the **project** and the regional pond. The **owner** must obtain written authorization from the applicable local governmental unit (LGU) or private entity that owns and maintains the regional pond. The LGU's or private entity's written authorization must identify that the regional pond will discharge the **water quality volume** (one (1) inch of runoff from the impervious watershed area) at no more than 5.66 cfs per acre of surface area of the pond. The **owner** must include the LGU's or private entities' written authorization in the **SWPPP**. The LGU's or private entity's written authorization must be obtained before the **owner** finalizes the **SWPPP** and before any application for this permit is made to the MPCA.

III.E RECORD RETENTION

The **SWPPP** (original or copies) including, all changes to it, and inspections and maintenance records must be kept at the site during construction by the **Permittee(s)** who has/have operational control of that portion of the site. The **SWPPP** can be kept in either the field office or in an on-site vehicle during normal working hours.

All **owner(s)** must keep the following records on file for three (3) years after submittal of the **NOT** as outlined in Part II.C. This does not include any records after submittal of the **NOT**.

1. The final SWPPP

2. Any other **stormwater** related permits required for the **project**

3. Records of all inspection and maintenance conducted during construction (Part IV.E. Inspections and Maintenance)

4. All permanent operation and maintenance agreements that have been implemented, including all right-of-way, contracts, covenants and other binding requirements regarding perpetual maintenance and

5. All required calculations for design of the temporary and permanent **Stormwater** Management Systems.

III.F. TRAINING REQUIREMENTS

The **Permittee(s)** shall ensure the following individuals identified in this part have been trained in accordance with this Permit's training requirements.

1. Who must be trained:

   a. Individual(s) preparing the **SWPPP** for the **project**

   b. Individual(s) overseeing implementation of, revising, and amending the **SWPPP** and individual(s) performing inspections as required in Part IV.E. One of these individual(s) must be available for an onsite inspection within 72 hours upon request by the MPCA.

   c. Individual(s) performing or supervising the installation, maintenance and repair of **BMPs**. At least one individual on a **project** must be trained in these job duties.

2. Training content: The content and extent of training must be commensurate with the individual's job duties and responsibilities with regard to activities covered under this permit for the **project**. At least one individual present on the permitted **project** site (or available to the **project** site in 72 hours) must be trained in the job duties described in Part III.F.1.b. and Part III.F.1.c.

3. The **Permittee(s)** shall ensure that the individuals are trained by local, state, federal agencies, professional organizations, or other entities with expertise in **erosion prevention**, **sediment control,** permanent **stormwater** management and the Minnesota **NPDES**/SDS Construction Stormwater Permit. An update refresher-training must be attended every three (3) years starting three (3) years from the issuance date of this permit.

PART IV. CONSTRUCTION ACTIVITY REQUIREMENTS

IV.A. STORMWATER POLLUTION PREVENTION PLAN

The **Permittee(s)** must implement the **SWPPP** and the requirements of this part. The **BMPs** identified in the **SWPPP** and in this permit must be selected, installed, and maintained in an appropriate and functional manner that is in accordance with relevant manufacturer specifications and accepted engineering practices.

IV.B. EROSION PREVENTION PRACTICES

1. The **Permittee(s)** must plan for and implement appropriate **BMPs** such as construction phasing, vegetative buffer strips, horizontal slope grading, inspection and maintenance of Part IV.E. and other construction practices that minimize erosion as necessary to comply with this permit and protect **waters of the state**. The location of areas not to be disturbed must be delineated (e.g., with flags, stakes, signs, silt fence etc.) on the **project** site before work begins. The **Permittee(s)** must minimize the need for disturbance of portions of the **project** that have **steep slopes**. For those sloped areas which must be disturbed, the **Permittee(s)** must use techniques such as phasing and **stabilization** practices designed for **steep slopes** (e.g., slope draining and terracing).

2. The **Permittee(s)** must **stabilize** all exposed soil areas (including stockpiles). **Stabilization** must be **initiated immediately** to limit soil erosion whenever any **construction activity** has permanently or temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days. **Stabilization** must be completed no later than 14 calendar days after the **construction activity** in that portion of the site has temporarily or permanently ceased. For **Public Waters** that the Minnesota Department of Natural Resources has promulgated "work

in water restrictions" during specified fish spawning time frames, all exposed soil areas that are within 200 feet of the water's edge, and drain to these waters must complete the **stabilization** activities within 24 hours during the restriction period. Temporary stockpiles without significant silt, clay or organic components (e.g., clean aggregate stockpiles, demolition concrete stockpiles, sand stockpiles) and the constructed base components of roads, parking lots and similar surfaces are exempt from this requirement but must be in compliance with Part IV.C.5.

3. If using **stormwater** conveyance channels ,the **Permittee(s)** must design the channels to route water around unstabilized areas on the site and to reduce erosion, unless **infeasible**. The **Permittee(s)** must use erosion controls and velocity dissipation devices such as check dams, sediment traps, riprap, or grouted riprap at outlets within and along the length of any constructed **stormwater** conveyance channel, and at any outlet, to provide a non-erosive flow velocity, to minimize erosion of channels and their embankments, outlets, adjacent stream banks, slopes, and downstream waters during discharge conditions.

4. The **Permittee(s)** must **stabilize** the **normal wetted perimeter** of any temporary or permanent drainage ditch or swale that drains water from any portion of the construction site, or diverts water around the site, within 200 lineal feet from the property edge, or from the point of discharge into any **surface water**. **Stabilization** of the last 200 lineal feet must be completed within 24 hours after connecting to a **surface water** or property edge.

   The **Permittee(s)** shall complete **stabilization** of the remaining portions of any temporary or permanent ditches or swales within 14 calendar days after connecting to a **surface water** or property edge and construction in that portion of the ditch has temporarily or permanently ceased.

   Temporary or permanent ditches or swales that are being used as a sediment containment system during construction (with properly designed rock-ditch checks, bio rolls, silt dikes, etc.) do not need to be **stabilized** during the temporary period of its use as a sediment containment system. These areas must be **stabilized** within 24 hours after no longer being used as a sediment containment system.

   Applying mulch, hydromulch, tackifier, polyacrylamide or similar **erosion prevention** practices is not acceptable **stabilization** in any part of a temporary or permanent drainage ditch or swale.

5. Pipe outlets must be provided with temporary or permanent **energy dissipation** within 24 hours after connection to a **surface water**.

6. Unless **infeasible** due to lack of pervious or vegetated areas, the **Permittee(s)** must direct discharges from **BMPs** to vegetated areas of the site (including any **natural buffers)** in order to increase sediment removal and maximize **stormwater** infiltration. The **Permittee(s)** must use velocity dissipation devices if necessary to prevent erosion when directing **stormwater** to vegetated areas.

IV.C. <u>SEDIMENT CONTROL PRACTICES</u>

1. The **Permittee(s)** must employ **Sediment control** practices as necessary to minimize sediment from entering **surface waters**, including curb and gutter systems and storm sewer inlets.

a. Temporary or permanent drainage ditches and sediment basins that are designed as part of a sediment containment system (e.g., ditches with rock-check dams) require **sediment control** practices only as appropriate for site conditions.

b. If the down gradient **sediment controls** are overloaded (based on frequent failure or excessive maintenance requirement), the **Permittee(s)** must install additional upgradient **sediment control** practices or redundant **BMPs** to eliminate the overloading, and the **SWPPP** must be amended to identify these additional practices as required in Part III.B 1.-3.

2. **Sediment control** practices must be established on all down gradient perimeters and be located upgradient of any buffer zones. The perimeter **sediment control** practice must be in place before any upgradient land-disturbing activities begin. These practices shall remain in place until **Final Stabilization** has been established in accordance with Part IV.G. A floating silt curtain placed in the water is not a **sediment control BMP** to satisfy perimeter control requirements in this part except when working on a shoreline and below the waterline. In those cases, a floating silt curtain can be used as a perimeter control practice if the floating silt curtain is installed as close to shore as possible. Immediately after the short term construction activity (e.g. installation of rip rap along the shoreline) in that area is complete, an upland perimeter control practice must be installed if exposed soils still drain to the surface water..

3. The **Permittee(s)** shall re-install all **sediment control** practices that have been adjusted or removed to accommodate short-term activities such as clearing or grubbing, or passage of vehicles, immediately after the short-term activity has been completed. The **Permittee(s)** shall complete any short-term activity that requires removal of **sediment control** practices as quickly as possible. The **Permittee(s)** must re-install **sediment control** practices before the next precipitation event even if the short-term activity is not complete.

4. All storm drain inlets must be protected by appropriate **BMPs** during construction until all sources with potential for discharging to the inlet have been **stabilized**. Inlet protection may be removed for a particular inlet if a specific safety concern (street flooding/freezing) has been identified by the **Permittee(s)** or the jurisdictional authority (e.g., city/county/township/MnDOT engineer).The **Permittee(s)** must document the need for removal in the **SWPPP.**

5. Temporary soil stockpiles must have silt fence or other effective **sediment controls**, and cannot be placed in any **natural buffers** or **surface waters**, including **stormwater** conveyances such as curb and gutter systems, or conduits and ditches unless there is a bypass in place for the **stormwater.**

6. Where vehicle traffic leaves any part of the site (or onto paved roads within the site):

   a. The **Permittee(s)** must install a vehicle tracking **BMP** to minimize the track out of sediment from the construction site. Examples of vehicle tracking **BMPs** include (but are not limited to) rock pads, mud mats, slash mulch, concrete or steel wash racks, or equivalent systems.

   b. The **Permittee(s)** must use street sweeping if such vehicle tracking **BMPs** are not adequate to prevent sediment from being tracked onto the street (see Part IV.E.5.d.).

7. The **Permittee(s)** must install temporary sedimentation basins as required in Part III.C. of this permit.

8. The **Permittee(s)** must minimize soil compaction and, unless **infeasible**, preserve topsoil. Minimizing soil compaction is not required where the function of a specific area of the site dictates that it be compacted.

9. The **Permittee(s)** must preserve a 50 foot **natural buffer** or (if a buffer is **infeasible** on the site) provide redundant **sediment controls** when a **surface water** is located within 50 feet of the **project's** earth disturbances and stormwater flows to the **surface water**. **Natural buffers** are not required adjacent to road ditches, judicial ditches, county ditches, **stormwater** conveyance channels, storm drain inlets, and sediment basins. The **Permittee(s)** is/are not required to enhance the quality of the vegetation that already exists in the buffer or provide vegetation if none exist. However, **Permittee(s)** can improve the natural buffer with vegetation.

10. If the **Permittee(s)** intend to use polymers, flocculants, or other sedimentation treatment chemicals on the **project** site, the **Permittee(s)** must comply with the following minimum requirements:

    a. The **Permittee(s)** must use conventional erosion and **sediment controls** prior to chemical addition to ensure effective treatment. Chemicals may only be applied where treated **stormwater** is directed to a **sediment control** system which allows for filtration or settlement of the floc prior to discharge.

    b. Chemicals must be selected that are appropriately suited to the types of soils likely to be exposed during construction, and to the expected turbidity, pH, and flow rate of **stormwater** flowing into the chemical treatment system or area.

    c. Chemicals must be used in accordance with accepted engineering practices, and with dosing specifications and sediment removal design specifications provided by the manufacturer or provider/supplier of the applicable chemicals.

IV.D. <u>DEWATERING AND BASIN DRAINING</u>

1. The **Permittee(s)** must discharge turbid or sediment-laden waters related to **dewatering** or basin draining (e.g., pumped discharges, trench/ditch cuts for drainage) to a temporary or permanent sedimentation basin on the **project** site unless **infeasible**. The **Permittee(s)** may discharge from the temporary or permanent sedimentation basins to **surface waters** if the basin water has been visually checked to ensure adequate treatment has been obtained in the basin and that nuisance conditions (see Minn. R. 7050.0210, subp. 2) will not result from the discharge. If the water cannot be discharged to a sedimentation basin prior to entering the **surface water**, it must be treated with the appropriate **BMPs**, such that the discharge does not adversely affect the receiving water or downstream properties. If the **Permittee(s)** must discharge water that contains oil or grease, the **Permittee(s)** must use an oil-water separator or suitable filtration device (e.g. cartridge filters, absorbents pads) prior to discharging the water. The **Permittee(s)** must ensure that discharge points are adequately protected from erosion and scour. The discharge must be dispersed over natural rock riprap, sand bags, plastic sheeting, or other accepted **energy dissipation** measures.

2. All water from **dewatering** or basin-draining activities must be discharged in a manner that does not cause nuisance conditions, erosion in receiving channels or on downslope properties, or inundation in **wetlands** causing significant adverse impact to the **wetland.**

3. If the **Permittee(s)** is/are using filters with backwash water, the **Permittee(s)** must haul the backwash water away for disposal, return the backwash water to the beginning of the treatment process, or incorporate the backwash water into the site in a manner that does not cause erosion. The Permittee(s) may discharge backwash water to the sanitary sewer if permission is granted by the sanitary sewer authority. The **Permittee(s)** must replace and clean the filter media used in **dewatering** devices when required to retain adequate function.

IV.E. INSPECTIONS AND MAINTENANCE

1. The **Permittee(s)** must ensure that a trained person (as identified in Part III.A.3.a.) will routinely inspect the entire construction site at least once every seven (7) days during active construction and within 24 hours after a rainfall event greater than 0.5 inches in 24 hours. Following an inspection that occurs within 24 hours after a rainfall event, the next inspection must be conducted within seven (7) days after the rainfall event.

2. All inspections and maintenance conducted during construction must be recorded within 24 hours in writing and these records must be retained with the **SWPPP** in accordance with Part III.E. Records of each inspection and maintenance activity shall include:

   a. Date and time of inspections

   b. Name of person(s) conducting inspections

   c. Findings of inspections, including the specific location where corrective actions are needed

   d. Corrective actions taken (including dates, times, and party completing maintenance activities)

   e. Date and amount of all rainfall events greater than 1/2 inch (0.5 inches) in 24 hours. Rainfall amounts must be obtained by a properly maintained rain gauge installed onsite, a weather station that is within 1 mile of your location or a weather reporting system that provides site specific rainfall data from radar summaries.

   f. If any discharge is observed to be occurring during the inspection, a record of all points of the property from which there is a discharge must be made, and the discharge should be described (i.e., color, odor, floating, settled, or suspended solids, foam, oil sheen, and other obvious indicators of pollutants) and photographed.

   g. Any amendments to the **SWPPP** proposed as a result of the inspection must be documented as required in Part III.B. within seven (7) calendar days.

3. Inspection frequency adjustment

   a. Where parts of the **project** site have **permanent cover**, but work remains on other parts of the site, the **Permittee(s)** may reduce inspections of the areas with **permanent cover** to

once per month.

b. Where construction sites have **permanent cover** on all exposed soil areas and no **construction activity** is occurring anywhere on the site, the site must be inspected during non-frozen ground conditions at least once per month for a period of twelve (12) months. Following the twelfth month of **permanent cover** and no **construction activity**, inspections may be terminated until **construction activity** is once again initiated unless the **Permittee(s)** is/are notified in writing by the MPCA that erosion issues have been detected at the site and inspections need to resume.

c. Where work has been suspended due to frozen ground conditions, the inspections may be suspended. The required inspections and maintenance schedule must begin within 24 hours after runoff occurs at the site or 24 hours prior to resuming construction, whichever comes first.

4. The **Permittee(s)** is/are responsible for the inspection and maintenance of temporary and permanent water quality management **BMPs**, as well as all **erosion prevention** and **sediment control BMPs**, until another **Permittee** has obtained coverage under this Permit according to Part II.B.5. or the **project** has undergone **Final Stabilization**, and an **NOT** has been submitted to the MPCA.

5. The **Permittee(s)** must inspect all **erosion prevention** and **sediment control BMPs** and Pollution Prevention Management Measures to ensure integrity and effectiveness during all routine and post-rainfall event inspections. All nonfunctional **BMPs** must be repaired, replaced, or supplemented with functional **BMPs** by the end of the next business day after discovery, or as soon as field conditions allow access unless another time frame is specified below. The **Permittee(s)** must investigate and comply with the following inspection and maintenance requirements:

   a. All perimeter control devices must be repaired, replaced, or supplemented when they become nonfunctional or the sediment reaches one-half (1/2) of the height of the device. These repairs must be made by the end of the next business day after discovery, or thereafter as soon as field conditions allow access.

   b. Temporary and permanent sedimentation basins must be drained and the sediment removed when the depth of sediment collected in the basin reaches one-half (1/2) the storage volume. Drainage and removal must be completed within 72 hours of discovery, or as soon as field conditions allow access (see Part IV.D.).

   c. **Surface waters**, including drainage ditches and conveyance systems, must be inspected for evidence of erosion and sediment deposition during each inspection. The **Permittee(s)** must remove all deltas and sediment deposited in **surface waters**, including drainage ways, catch basins, and other drainage systems, and restabilize the areas where sediment removal results in exposed soil. The removal and **stabilization** must take place within seven (7) days of discovery unless precluded by legal, regulatory, or physical access constraints. The **Permittee(s)** shall use all reasonable efforts to obtain access. If precluded, removal and **stabilization** must take place within seven (7) calendar days of obtaining access. The **Permittee(s)** is/are responsible for contacting all local, regional, state and federal authorities and receiving any applicable permits, prior to conducting any work in surface waters.

d. Construction site vehicle exit locations must be inspected for evidence of off-site sediment tracking onto paved surfaces. Tracked sediment must be removed from all paved surfaces both on and off site within 24 hours of discovery, or if applicable, within a shorter time to comply with Part IV.C.6.

e. Streets and other areas adjacent to the **project** must be inspected for evidence of off-site accumulations of sediment. If sediment is present, it must be removed in a manner and at a frequency sufficient to minimize off-site impacts (e.g., fugitive sediment in streets could be washed into storm sewers by the next rain and/or pose a safety hazard to users of public streets).

6. All infiltration areas must be inspected to ensure that no sediment from ongoing **construction activity** is reaching the infiltration area. All infiltration areas must be inspected to ensure that equipment is not being driven across the infiltration area.

IV.F. POLLUTION PREVENTION MANAGEMENT MEASURES

The **Permittee(s)** shall implement the following pollution prevention management measures on the site:

1. Storage, Handling, and Disposal of Construction Products, Materials, and Wastes: The **Permittee(s)** shall comply with the following to minimize the exposure to **stormwater** of any of the products, materials, or wastes. Products or wastes which are either not a source of contamination to stormwater or are designed to be exposed to stormwater are not held to this requirement:

   a. Building products that have the potential to leach pollutants must be under cover (e.g., plastic sheeting or temporary roofs) to prevent the discharge of pollutants or protected by a similarly effective means designed to minimize contact with **stormwater**.

   b. Pesticides, herbicides, insecticides, fertilizers, treatment chemicals, and landscape materials must be under cover (e.g., plastic sheeting or temporary roofs) to prevent the discharge of pollutants or protected by similarly effective means designed to minimize contact with **stormwater**.

   c. Hazardous materials, toxic waste, (including oil, diesel fuel, gasoline, hydraulic fluids, paint solvents, petroleum-based products, wood preservatives, additives, curing compounds, and acids) must be properly stored in sealed containers to prevent spills, leaks or other discharge. Restricted access storage areas must be provided to prevent vandalism. Storage and disposal of hazardous waste or hazardous materials must be in compliance with Minn. R. ch. 7045 including secondary containment as applicable.

   d. Solid waste must be stored, collected and disposed of properly in compliance with Minn. R. ch. 7035.

   e. Portable toilets must be positioned so that they are secure and will not be tipped or knocked over. Sanitary waste must be disposed of properly in accordance with Minn. R. ch. 7041.

2. Fueling and Maintenance of Equipment or Vehicles; Spill Prevention and Response: The **Permittee(s)** shall take reasonable steps to prevent the discharge of spilled or leaked chemicals, including fuel, from any area where chemicals or fuel will be loaded or unloaded including the use of drip pans or absorbents unless infeasible. The **Permittee(s)** must conduct fueling in a contained area unless infeasible. The **Permittee(s)** must ensure adequate supplies are available at all times to clean up discharged materials and that an appropriate disposal method is available for recovered spilled materials. The **Permittee(s)** must report and clean up spills immediately as required by Minn. Stat. § 115.061, using dry clean up measures where possible.

3. Vehicle and equipment washing: If the **Permittee(s)** wash the exterior of vehicles or equipment on the **project** site, washing must be limited to a defined area of the site. Runoff from the washing area must be contained in a sediment basin or other similarly effective controls and waste from the washing activity must be properly disposed of. The **Permittee(s)** must properly use and store soaps, detergents, or solvents. No engine degreasing is allowed on site.

4. Concrete and other washouts waste: The **Permittee(s)** must provide effective containment for all liquid and solid wastes generated by washout operations (concrete, stucco, paint, form release oils, curing compounds and other construction materials) related to the **construction activity**. The liquid and solid washout wastes must not contact the ground, and the containment must be designed so that it does not result in runoff from the washout operations or areas. Liquid and solid wastes must be disposed of properly and in compliance with MPCA rules. A sign must be installed adjacent to each washout facility that requires site personnel to utilize the proper facilities for disposal of concrete and other washout wastes.

IV.G. FINAL STABILIZATION

The **Permittee(s)** must ensure **Final Stabilization** of the site. **Final Stabilization** is not complete until all requirements of Parts IV.G.1-5. are complete:

1. All soil disturbing activities at the site have been completed and all soils are **stabilized** by a uniform perennial vegetative cover with a density of 70 percent of its expected final growth density over the entire pervious surface area, or other equivalent means necessary to prevent soil failure under erosive conditions.

2. The permanent **stormwater** management system is constructed, meets all requirements in Part III.D. and is operating as designed. Temporary or permanent sedimentation basins that are to be used as permanent water quality management basins have been cleaned of any accumulated sediment. All sediment has been removed from conveyance systems and ditches are **stabilized** with **permanent cover**.

3. All temporary synthetic and structural **erosion prevention** and **sediment control BMPs** (such as silt fence) have been removed on the portions of the site for which the **Permittee(s)** is/are responsible. **BMPs** designed to decompose on site (such as some compost logs) may be left in place.

4. For residential construction only, individual lots are considered finally **stabilized** if the structure(s) are finished and **temporary erosion protection** and downgradient perimeter control has been completed and the residence has been sold to the homeowner. Additionally, the **Permittee** has distributed the MPCA's "**Homeowner Fact Sheet"** to the homeowner to inform

the homeowner of the need for, and benefits of, **permanent cover**.

5. For construction **projects** on agricultural land (e.g., pipelines across crop, field pasture or range land) the disturbed land has been returned to its preconstruction agricultural use.

PART V. GENERAL PROVISIONS

V.A. APPLICABILITY CRITERIA

1. If the **Commissioner** determines that pollution in **stormwater** discharges associated with a **construction activity** are contributing to a violation of a water quality standard or due to specific site considerations rendering a substantial portion of the requirements of this permit impossible to comply with, and the **Commissioner** determines that the **construction activity** would be more appropriately regulated by an individual permit, the **Commissioner** may terminate coverage under this general permit and require the **owner and operator** to continue the **construction activity** subject to an individual **stormwater** discharge permit. Upon issuance of an individual permit, this general permit would no longer apply. Prior to termination of coverage under this general permit, the **Commissioner** will provide notice and an opportunity to request a contested case hearing.

2. If the terms and conditions of this general permit cannot be met, an **owner** may request an individual permit, in accordance with Minn. R. 7001.0210 subp. 6.

3. Any interested person may petition the MPCA to require an individual **NPDES**/SDS permit in accordance with 40 CFR 122.28(b)(3).

V.B. RECORD AVAILABILITY

1. The **Permittee(s)** must make the **SWPPP**, including all certificates, reports, records, or other information required by this permit, available to federal, state, and local officials within 72 hours upon request for the duration of the permit and for three (3) years following the **NOT**. This does not include any records after submittal of the **NOT**.

2. When requested by the MPCA, the **Permittee(s)** must make the responsible person trained as required in Part III.F.1.b. or Part III.F.1.c. available to be onsite during an MPCA inspection within 72 hours of a request.

V.C. PROHIBITIONS

This permit prohibits discharges of any material other than **stormwater** treated in compliance with this permit and discharges from **dewatering** or basin draining activities in accordance with Part IV.D.1.-2. Prohibited discharges include (but are not limited to) wastewater from washout of concrete, stucco, paint, form release oils, curing compounds and other construction materials, fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance, soaps or solvents used in vehicle and equipment washing and maintenance, and other hazardous substances or wastes.

V.D. TRANSFER OF OWNERSHIP OR CONTROL

This permit may not be assigned or transferred by the **Permittee(s)** except when transfer occurs in accordance with the applicable requirements of Part II.B.5.

V.E. CIVIL AND CRIMINAL LIABILITY

Nothing in this permit must be construed to relieve the **Permittee(s)** from civil or criminal penalties for noncompliance with the terms and conditions provided herein. Nothing in this permit must be construed to preclude the initiation of any legal action or relieve the **Permittee(s)** from any responsibilities, liabilities, or penalties to which the **Permittee(s)** is/are or may be subject to under Section 311 of the Clean Water Act and Minn. Stat. § 115 and 116, as amended. The **Permittee(s)** is/are not liable for permit requirements for activities occurring on those portions of a site where the permit has been transferred to another party as required in Part II.B.5. or the **Permittee(s) has/**have submitted the **NOT** as required in Part II.C.

V.F. SEVERABILITY

The provisions of this permit are severable. If any provision of this permit, or the application of any provision of this permit to any circumstances, is held invalid, the application of such provision to other circumstances, and the remainder of this permit must not be affected thereby.

V.G. NPDES/SDS RULE STANDARD GENERAL CONDITIONS

The **Permittee(s)** must comply with the provisions of Minn. R. 7001.0150, subp. 3 and Minn. R. 7001.1090, subp. 1(A), 1(B), 1(C), 1(H), 1(I), 1(J), 1(K), and 1(L).

V.H. INSPECTION AND ENTRY

The **Permittee(s)** must allow access as provided in 40 CFR 122.41(i) and Minn. Stat. § 115.04. The **Permittee(s)** shall allow representatives of the MPCA or any member, employee or agent thereof, when authorized by it, upon presentation of credentials, to enter upon any property, public or private, for the purpose of obtaining information or examination of records or conducting surveys or investigations.

APPENDIX A

A. GENERAL REQUIREMENTS

All requirements in this Appendix are in addition to **BMPs** already specified in the permit. Where provisions of Appendix A, conflict with requirements elsewhere in the permit, the provisions in Appendix A take precedence. All **BMPs** used to comply with this Appendix must be documented in the **SWPPP** for the **project**. If the terms and conditions of this Appendix cannot be met, an individual permit will be required in accordance with Minn. R. ch. 7001.

B. REQUIREMENTS FOR DISCHARGES TO SPECIAL WATERS AND IMPAIRED WATERS

Additional **BMPs** and enhanced runoff controls identified in this Part are required for discharges to the following special waters (Part B.1 through B.9 of Appendix A) and impaired waters (Part B.10 of Appendix A). The **BMPs** identified for each special or impaired water are required for those areas of

the **project** draining to a discharge point on the **project** that is within one mile (**aerial radius measurement**) of special or impaired water and flows to that special or impaired water.

1. Wilderness areas: Boundary Waters Canoe Area Wilderness; Voyageurs National Park; Kettle River from the site of the former dam at Sandstone to its confluence with the Saint Croix River; Rum River from Ogechie Lake spillway to the northernmost confluence with Lake Onamia. Discharges to these waters must incorporate the **BMPs** outlined in C.1., C.2., and C.3. of this Appendix.

2. Mississippi River: Those portions from Lake Itasca to the southerly boundary of Morrison County that are included in the Mississippi Headwaters Board comprehensive plan dated February 12, 1981. Discharges to these waters must incorporate the **BMPs** outlined in C.1., C.2. and C.3. of this Appendix.

3. Scenic or recreational river segments: Saint Croix River, entire length; Cannon River from northern city limits of Faribault to its confluence with the Mississippi River; North Fork of the Crow River from Lake Koronis outlet to the Meeker-Wright county line; Kettle River from north Pine County line to the site of the former dam at Sandstone; Minnesota River from Lac qui Parle dam to Redwood County State Aid Highway 11; Mississippi River from County State Aid Highway 7 bridge in Saint Cloud to northwestern city limits of Anoka; and Rum River from State Highway 27 bridge in Onamia to Madison and Rice streets in Anoka. Discharges to these waters must incorporate the **BMPs** outlined in C.1., C.2. and C.3. of this Appendix.

4. Lake Superior: (Prohibited and restricted) Discharges to Lake Superior must incorporate the **BMPs** outlined in C.1., C.2. and C.3. of this Appendix.

5. Lake Trout Lakes: Identified in Minn. R. 7050.0470, including those inside the boundaries of the Boundary Waters Canoe Area Wilderness and Voyageurs National Park. Discharges to these waters must incorporate the **BMPs** outlined in C.1., C.2., and C.3. of this Appendix.

6. Trout Lakes: Identified in Minn. R. 6264.0050, subp. 2. Discharges to these waters must incorporate the **BMPs** outlined in C.1., C.2., and C.3., of this Appendix.

7. Scientific and natural areas: Boot Lake, Anoka County; Kettle River in sections 15, 22, 23, T 41 N, R 20, Pine County; Pennington Bog, Beltrami County; Purvis Lake-Ober Foundation, Saint Louis County; waters within the borders of Itasca Wilderness Sanctuary, Clearwater County; Iron Springs Bog, Clearwater County; Wolsfeld Woods, Hennepin County; Green Water Lake, Becker County; Blackdog Preserve, Dakota County; Prairie Bush Clover, Jackson County; Black Lake Bog, Pine County; Pembina Trail Preserve, Polk County; and Falls Creek, Washington County. Discharges to these waters must incorporate the **BMPs** outlined in C.1., C.2., and C.3. of this Appendix.

8. Trout Streams: Listed in Minn. R. 6264.0050, subp. 4. Discharges to these waters must incorporate the **BMPs** outlined in C.1., C.2., C.3., and C.4. of this Appendix.

9. Calcareous Fens: Listed in Minn. R 7050.0180 subp.6b. Discharges to these Calcareous Fens must incorporate the **BMPs** outlined in C.1. and C.2. of this Appendix.

10. Impaired Waters: Waters identified as impaired under section 303 (d) of the federal Clean Water

Act for phosphorus (nutrient eutrophication biological indicators), turbidity, dissolved oxygen or aquatic biota (fish bioassessment, aquatic plant bioassessment and aquatic macroinvertebrate bioassessment).

a. Impaired Water Without an Approved TMDL or With an Approved TMDL and No Waste Load Allocation:

   If runoff from the site discharges to an impaired water, and a TMDL has not been approved by USEPA or there is a USEPA approved TMDL that does not establish a Waste Load Allocation (WLA) for construction **stormwater**, discharges to these waters must incorporate the **BMPs** outlined in C.1. and C.2. of this Appendix.

b. Impaired Water With an Approved TMDL and WLA:

   If runoff from the site discharges to an impaired water for which there is a USEPA approved TMDL that establishes a WLA for construction **stormwater**, and the TMDL does not identify any specific implementation activities that would apply to the site discharges, discharges to these waters must incorporate the **BMPs** outlined in C.1. and C.2. of this Appendix.

   If the TMDL identifies specific implementation activities regarding construction **stormwater** that would apply to the site discharges, the **Permittee(s)** must include the following in the **SWPPP**:

   i. Identify the receiving water, the areas of the site discharging to it, and the pollutant(s) identified in the TMDL and

   ii. **BMPs** identified in the TMDL and any other specific construction **stormwater** related implementation activities identified in the TMDL.

Note on impaired waters listing terminology: The terms in parenthesis in Appendix A, Part B.10. above are the most current terminology used to list waters as impaired at the time of permit issuance. These terms are subject to change. For example, at one time waters were listed as impaired for phosphorus and now those same waters are listed as impaired for nutrient eutrophication biological indicators. If the terminology changes for one of the pollutant(s) or stressor(s) identified in the permit, the MPCA will keep a list of the new terms on its construction **stormwater** website.

C. ADDITIONAL **BMPS** FOR SPECIAL WATERS AND IMPAIRED WATERS

For the **BMPs** described in C.2., and C.4. of this Appendix:

Where the proximity to bedrock precludes the installation of any of the permanent **stormwater** management practices outlined in Appendix A, other treatment (such as grassed swales, smaller ponds, or grit chambers) is required prior to discharge to **surface waters**.

For work on linear **projects** with lack of right-of-way where the **Permittee(s)** cannot obtain an easement or other permission for property needed to install treatment systems capable of treating the entire **water quality volume** on site, the **Permittee(s)** must maximize the **water quality volume** that can be treated prior to discharge to **surface waters**. Treatment can be provided through other

methods or combination of methods such as grassed swales, filtration systems, smaller ponds or grit chambers prior to discharge to **surface waters**. A reasonable attempt must be made to obtain right-of-way during the **project** planning process. Documentation of these attempts must be in the **SWPPP** per Part III.A.5.m. in the section addressing **infeasibility**.

1. During construction:

    a. **Stabilization** of all exposed soil areas must be **initiated immediately** to limit soil erosion but in no case completed later than seven (7) days after the **construction activity** in that portion of the site has temporarily or permanently ceased.

    b. Temporary sediment basin requirements described in Part III.C. must be used for common drainage locations that serve an area with five (5) or more acres disturbed at one time.

2. Post construction: The **water quality volume** that must be retained on site by the **project's** permanent **stormwater** management system described in Part III.D. shall be one (1) inch of runoff from the new **impervious surfaces** created by the **project**. See Part III.D.1. for more information on infiltration design, prohibitions and appropriate site conditions.

3. Buffer zone: The **Permittee(s)** shall include an undisturbed buffer zone of not less than 100 linear feet from the special water (not including tributaries) and this buffer zone shall be maintained at all times, both during construction and as a permanent feature post construction, except where a water crossing or other encroachment is necessary to complete the **project**. The **Permittee(s)** must fully document the circumstance and reasons that the buffer encroachment is necessary in the **SWPPP** and include restoration activities. Replacement of existing **impervious surface** within the buffer is allowed under this permit. All potential water quality, scenic and other environmental impacts of these exceptions must be minimized by the use of additional or redundant **BMPs** and documented in the **SWPPP** for the **project**.

4. Temperature Controls: The **Permittee(s)** must design the Permanent **Stormwater** Management System such that the discharge from the **project** will minimize any increase in the temperature of trout stream receiving waters resulting from the one (1)-and two (2)-year 24-hour precipitation events. This includes all tributaries of designated trout streams within the Public Land Survey System (PLSS) Section that the trout stream is located. **Projects** that discharge to trout streams must minimize the impact using one or more of the following measures, in order of preference:

    a. Minimize new **impervious surfaces**.

    b. Minimize the discharge from connected **impervious surfaces** by discharging to vegetated areas, or grass swales, and through the use of other non-structural controls.

    c. Infiltration or other volume reduction practices to reduce runoff in excess of pre-**project** conditions (up to the two (2)-year 24-hour precipitation event).

    d. If ponding is used, the design must include an appropriate combination of measures such as shading, filtered bottom withdrawal, vegetated swale discharges or constructed wetland treatment cells that will limit temperature increases. The pond should be designed to draw down in 24 hours or less.

e. Other methods that will minimize any increase in the temperature of the trout stream.

D. REQUIREMENTS FOR DISCHARGING TO WETLANDS

If the **project** has any discharges with the potential for significant adverse impacts to a **wetland,** (e.g., conversion of a natural **wetland** to a **stormwater** pond) the **Permittee(s)** must demonstrate that the **wetland** mitigative sequence has been followed in accordance with D.1 or D.2 of this Appendix.

1. If the potential adverse impacts to a **wetland** on a specific **project** site have been addressed by permits or other approvals from an official statewide program (U.S. Army Corps of Engineers 404 program, Minnesota DNR, or the State of Minnesota Wetland Conservation Act) that are issued specifically for the **project** and **project** site, the **Permittee(s)** may use the permit or other determination issued by these agencies to show that the potential adverse impacts have been addressed. For the purposes of this permit, deminimus actions are determinations by the permitting agency that address the **project** impacts, whereas a non-jurisdictional determination does not address **project** impacts.

2. If there are impacts from the **project** that are not addressed in one of the permits or other determinations discussed in Appendix A, Part D.1. (e.g., permanent inundation or flooding of the **wetland**, significant degradation of water quality, excavation, filling, draining), the **Permittee(s)** must minimize all adverse impacts to **wetlands** by utilizing appropriate measures. Measures used must be based on the nature of the **wetland**, its vegetative community types and the established hydrology. These measures include in order of preference:

   a. Avoid all significant adverse impacts to **wetlands** from the **project** and post-**project** discharge.

   b. Minimize any unavoidable impacts from the **project** and post-**project** discharge.

   c. Provide compensatory mitigation when the **Permittee(s)** determine(s) that there is no reasonable and practicable alternative to having a significant adverse impact on a **wetland**. For compensatory mitigation, **wetland** restoration or creation shall be of the same type, size and whenever reasonable and practicable in the same watershed as the impacted **wetland**.

E. DISCHARGES REQUIRING ENVIRONMENTAL REVIEW

This permit does not replace or satisfy any environmental review requirements, including those under the Minnesota Environmental Policy Act or the National Environmental Policy Act. The **owner** must verify that any environmental review required by law, including any required Environmental Assessment Work sheets or Environmental Impact Statements, Federal environmental review, or other required review is complete before making application for coverage under this permit, and the **owner** must incorporate any **stormwater** mitigation measures required as the result of any environmental review into the **SWPPP** for the **project**. If any part of your **common plan of development or sale** requires environmental review, coverage under this permit cannot be obtained until such environmental review is complete.

F. DISCHARGES AFFECTING ENDANGERED OR THREATENED SPECIES

This permit does not replace or satisfy any review requirements for endangered or threatened species, from new or expanded discharges that adversely impact or contribute to adverse impacts on a listed endangered or threatened species, or adversely modify a designated critical habitat. The **owner** must conduct any required review and coordinate with appropriate agencies for any **project** with the potential of affecting threatened or endangered species, or their critical habitat.

G. DISCHARGES AFFECTING HISTORIC PLACES OR ARCHEOLOGICAL SITES

This permit does not replace or satisfy any review requirements for historic places or archeological sites, from new or expanded discharges that adversely affect properties listed or eligible for listing in the National Register of Historic Places or affecting known or discovered archeological sites. The **owner** must be in compliance with National Historic Preservation Act and conduct all required review and coordination related to historic preservation, including significant anthropological sites and any burial sites, with the Minnesota Historic Preservation Officer.

APPENDIX B. – DEFINITIONS

1. **"Aerial radius measurement"** means the shortest straight line distance measurement between the point of **stormwater** discharge from a **project** construction site to the nearest edge of the water body the **stormwater** will flow to. This measurement does not follow the meander flow path.

2. **"Best Management Practices (BMPs)"** means the most effective and practicable means of **erosion prevention** and **sediment control**, and water quality management practices that are the most effective and practicable means of to control, prevent, and minimize degradation of **surface water**, including avoidance of impacts, construction-phasing, minimizing the length of time soil areas are exposed, prohibitions, pollution prevention through good housekeeping, and other management practices published by state or designated area-wide planning agencies.

   Individual **BMPs** found in this permit are described in the current versions of Protecting Water Quality in Urban Areas, MPCA and The Minnesota Stormwater Manual, MPCA. **BMPs** must be adapted to the site and can be adopted from other sources. However, they must be similar in purpose and at least as effective and stringent as MPCA's **BMPs**. (Other sources include manufacturers specifications, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices, U.S. Environmental Protection Agency 1992, and Erosion Control Design Manual, Minnesota Department of Transportation, et al, 1993).

3. **"Commissioner"** means the **Commissioner** of the MPCA or the **Commissioner's** designee.

4. **"Common Plan of Development or Sale"** means a contiguous area where multiple separate and distinct land-disturbing activities may be taking place at different times, on different schedules, but under one proposed plan. One plan is broadly defined to include design, permit application, advertisement or physical demarcation indicating that land-disturbing activities may occur.

5. **"Construction Activity"** includes **construction activity** as defined in 40 C.F.R. pt. 122.26(b)(14)(x) and small construction activity as defined in 40 C.F.R. pt. 122.26(b)(15) and **construction activity** as defined by Minn. R. 7090.0080, subp. 4. This includes a disturbance to the land that results in a change in the topography, existing soil cover (both vegetative and non-vegetative), or the existing soil topography that may result in accelerated **stormwater** runoff, leading to soil erosion and

movement of sediment into **surface waters** or drainage systems. Examples of **construction activity** may include clearing, grading, filling, and excavating. **Construction activity** includes the disturbance of less than one acre of total land area that is a part of a larger **common plan of development or sale** if the larger common plan will ultimately disturb one (1) acre or more. **Construction activity** does not include a disturbance to the land of less than five (5) acres for the purpose of routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of the facility.

6. **"Dewatering"** means the removal of surface or ground water to dry and/or solidify a construction site to enable **construction activity**. Dewatering may require a Minnesota Department of Natural Recourses water appropriation permit and, if dewatering water is contaminated, discharge of such water may require an individual MPCA **NPDES**/SDS permit.

7. **"Energy Dissipation"** means methods employed at pipe outlets to prevent erosion caused by the rapid discharge of water scouring soils. Examples include, but are not limited to: concrete aprons, riprap, splash pads, and gabions that are designed to prevent erosion.

8. **"Erosion Prevention"** means measures employed to prevent erosion. Examples include but not limited to: soil **stabilization** practices, limited grading, mulch, **temporary erosion protection** or **permanent cover**, and construction phasing.

9. **"Final Stabilization"** means required actions in Part IV.G. taken after the completion of **construction activities** and prior to submitting the **NOT** that are intended to prevent discharge of pollutants associated with stormwater discharges from the **project**.

10. **"Homeowner Fact Sheet"** means a fact sheet developed by the MPCA and available on the MPCA Construction **Stormwater** website to be given to homeowners at the time of sale by a builder to inform the homeowner of the need for, and benefits of, **Final Stabilization**.

11. **"Infeasible"** means not technologically possible or not economically practicable and achievable in light of the best industry practices.

12. **"Initiated immediately"** means taking an action to commence **stabilization** as soon as practicable, but no later than the end of the work day, following the day when the earth-disturbing activities have temporarily or permanently ceased, if the **Permittee(s)** know that construction work on that portion of the site will be temporarily ceased for 14 or more additional calendar days or 7 calendar days where Appendix A.C.1.a applies. The following activities can be taken to initiate **stabilization**:

    1. prepping the soil for vegetative or non-vegetative **stabilization**

    2. applying mulch or other non-vegetative product to the exposed soil area

    3. seeding or planting the exposed area

    4. starting any of the activities in # 1 – 3 on a portion of the area to be **stabilized**, but not on the entire area and

    5. finalizing arrangements to have **stabilization** product fully installed in compliance with the applicable deadline for completing **stabilization**

13. **"Impervious Surface"** means a constructed hard surface that either prevents or retards the entry of water into the soil and causes water to run off the surface in greater quantities and at an increased rate of flow than prior to development. Examples include rooftops, sidewalks, patios, driveways, parking lots, storage areas, and concrete, asphalt, or gravel roads.

14. **"National Pollutant Discharge Elimination System (NPDES)"** means the program for issuing, modifying, revoking, reissuing, terminating, monitoring, and enforcing permits under the Clean Water Act (Sections 301, 318, 402, and 405) and United States Code of Federal Regulations Title 33, Sections 1317, 1328, 1342, and 1345.

15. **"Natural Buffer"** means an area of undisturbed cover surrounding surface waters within which construction activities are restricted. **Natural buffer** includes the vegetation, exposed rock, or barren ground that exists prior to commencement of earth-disturbing activities.

16. **"Normal Wetted Perimeter"** means the area of a conveyance, such as a ditch, channel, or pipe that is in contact with water during flow events that are expected to occur from a two-year 24-hour storm event.

17. **"Notice of Termination (NOT)"** means notice to terminate coverage under this permit after construction is complete, the site has undergone **Final Stabilization**, and maintenance agreements for all permanent facilities have been established, in accordance with all applicable conditions of this permit.

18. **"Operator"** means the person designated by the **owner**, who has day to day operational control and/or the ability to modify **project** plans and specifications related to the **SWPPP**. The operator must be named on the permit as a **Permittee**.

19. **"Owner"** means the person or party possessing the title of the land on which the construction activities will occur; or if the **construction activity** is for a lease, easement, or mineral rights license holder, the party or individual identified as the lease, easement or mineral rights license holder; or the contracting government agency responsible for the **construction activity**.

20. **"Permanent Cover"** means surface types that will prevent soil failure under erosive conditions. Examples include: gravel, asphalt, concrete, rip rap, roof tops, perennial cover, or other landscaped material that will permanently arrest soil erosion. A uniform perennial vegetative cover (i.e. evenly distributed, without large bare areas) with a density of 70 percent of the native background vegetative cover for the area must be established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures. **Permanent cover** does not include the practices listed under **temporary erosion protection**.

21. **"Permittee(s)"** means the person or persons, firm, or governmental agency or other entity that signs the application submitted to the MPCA and is responsible for compliance with the terms and conditions of this permit.

22. **"Project(s)"** means all **construction activity** that is planned and/or conducted under a particular permit. The **project** will occur on the site or sites described in the permit application, the **SWPPP** and in the associated plans, specifications and contract documents.

23. "**Public Waters**" means all water basins and watercourses that are described in Minn. Stat. § 103G.005 subd. 15.

24. **"Saturated Soil"** means the highest seasonal elevation in the soil that is in a reduced chemical state because of soil voids being filled with water **Saturated soil** is evidenced by the presence of redoximorphic features or other information.

25. **"Sediment Control"** means methods employed to prevent sediment from leaving the site. **Sediment control** practices include silt fences, sediment traps, earth dikes, drainage swales, check dams, subsurface drains, bio rolls, rock logs, compost logs, storm drain inlet protection, and temporary or permanent sedimentation basins. A floating silt curtain placed in the water is not a **sediment control BMP** to satisfy perimeter control requirements, except as provided for in Part IV.C.2.

26. **"Stabilize, Stabilized, Stabilization"** means the exposed ground surface has been covered by appropriate materials such as mulch, staked sod, riprap, erosion control blanket, mats or other material that prevents erosion from occurring. Grass, agricultural crop or other seeding alone is not **stabilization**. Mulch materials must achieve approximately 90 percent ground coverage (typically 2 ton/acre).

27. **"Standard details"** means generic drawings showing a common or repeated **construction activity** or practice.

28. **"Stormwater"** is defined under Minn. R. 7077.0105, subp. 41(b), and includes precipitation runoff, **stormwater** runoff, snowmelt runoff, and any other surface runoff and drainage.

29. **"Steep Slopes"** means slopes that are 1:3 (V:H) (33.3 percent) or steeper in grade.

30. **"Storm Water Pollution Prevention Plan (SWPPP)"** means a plan for **stormwater** discharge that includes all required content under Part III of this Permit and which describes the **erosion prevention BMPs**, **sediment control BMPs** and Permanent **Stormwater** Management Systems that, when implemented, will decrease soil erosion on a parcel of land and decrease off-site nonpoint pollution.

31. **"Surface Water or Waters"** means all streams, lakes, ponds, marshes, **wetlands**, reservoirs, springs, rivers, drainage systems, waterways, watercourses, and irrigation systems whether natural or artificial, public or private, except that **surface waters** do not include treatment basins or ponds that were constructed from upland. Treatment basins or ponds that were constructed in **wetlands** and mitigated in accordance with Appendix A.D are also not considered surface waters for purposes of this permit.

32. **"Temporary Erosion Protection"** means methods employed to prevent erosion during construction activities. Examples of **temporary erosion protection** include, but are not limited to: straw, wood fiber blanket, wood chips, vegetation, mulch, and rolled erosion control products.

33. **"Underground Waters"** means water contained below the surface of the earth in the saturated zone including, without limitation, all waters whether under confined, unconfined, or perched conditions, in near surface unconsolidated sediment or regolith, or in rock formations deeper underground. The term ground water shall be synonymous with underground water.

34. **"Waters of the State"** (as defined in Minn. Stat. § 115.01, subd. 22) means all streams, lakes, ponds, marshes, watercourses, waterways, wells, springs, reservoirs, aquifers, irrigation systems, drainage systems and all other bodies or accumulations of water, surface or underground, natural or artificial, public or private, which are contained within, flow through, or border upon the state or any portion thereof.

35. **"Water Quality Volume"** means one (1) inch of runoff from the new **impervious surfaces** created by this **project** (calculated as an instantaneous volume) and is the volume of water to be treated in the Permanent **Stormwater** Management System, as required by this permit.

36. **"Wetland" or "Wetlands"** is defined in Minn. R. 7050.0186, subp. 1a.B. and includes those areas that are inundated or saturated by **surface water** or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in **saturated soil** conditions. **Wetlands** generally include swamps, marshes, bogs, and similar areas. Constructed wetlands designed for wastewater treatment are not **waters of the state**. **Wetlands** must have the following attributes:

    a. A predominance of hydric soils

    b. Inundated or saturated by **surface water** or groundwater at a frequency and duration sufficient to support a prevalence of hydrophytic vegetation typically adapted for life in a **saturated soil** condition and

    c. Under normal circumstances support a prevalence of such vegetation.

CHAPTER 54. STORM WATER MANAGEMENT

54.10. Authority. This ordinance is adopted pursuant to the authorization and policies contained in Minnesota Statutes, Chapters 103B and 462, and Minnesota Rules, Chapters 8410 and 8420. (99-Or-156, § 1, 11-24-99)

54.20. Purpose. The purpose of this ordinance is to minimize negative impacts of storm water runoff rates, volumes and quality on Minneapolis lakes, streams, wetlands, and the Mississippi River by guiding future significant development and redevelopment activity, and by assuring long-term effectiveness of existing and future storm water management constructed facilities. Chapter 54 establishes standards and specifications for conservation practices and planning activities in order to achieve policies regarding water resource management, flood control, and other community services as described in city, regional, state, and federal documents and statutes. (99-Or-156, § 1, 11-24-99)

54.30. Minneapolis Storm Water Management Design Manual (Design Manual). The Design Manual is the compilation of design performance, and review criteria approved by the city engineer and adopted by the city council for storm water management practices. In any event of apparent non-conformance, the city council shall adopt a resolution that establishes an interim design manual, design performance standards, and review criteria. In the absence of an adopted Minneapolis Storm Water Management Design Manual, the publication entitled Protecting Water Quality in Urban Areas: Best Management Practices For Minnesota prepared by the Minnesota Pollution Control Agency (MPCA), October, 1989, and subsequent updates, shall serve as the approved Design Manual. Copies of the Design Manual can be obtained from the Minneapolis Department of Public Works. (99-Or-156, § 1, 11-24-99)

54.40. Definitions. For the purposes of Chapter 54, the following terms, phrases, words, and their derivatives shall have the meaning stated below:

Applicant is any person who submits a Storm Water Management Plan pursuant to this ordinance and the person's agents, employees, and others acting under this person's direction.

Assistant city coordinator of regulatory services is the Assistant City Coordinator of Regulatory Services of the City of Minneapolis and the assistant city coordinator's duly authorized designees.

Best Management Practices (BMP) --See Storm Water Management Best Management Practices.

City engineer is the City Engineer/Director of Public Works of the City of Minneapolis and duly authorized designees.

Clearing and grubbing is the cutting and removal of trees, shrub, bushes, windfalls and other vegetation including removal of stumps, roots, and other remains.

Connected actions --See phased or connected actions.

Constructed facilities --See storm water management constructed facilities.

Detention facility is a natural or built structure that provides for the temporary storage of storm water runoff and release at controlled rates.

Design Manual --See Minneapolis Storm Water Management Design Manual, Section 54.30.

Impervious surface is one that does not allow rainfall to soak into the ground, including but not limited to the rooftops and paved areas such as roads, parking lots, driveways, sidewalks and plazas.

Issuing authority for Storm Water Management Plan approval and certification is the city engineer and for registration and maintenance is the director of regulatory services.

Land disturbing activity is any land change, including phased or connected actions, within the City of Minneapolis including, but not limited to, building demolition, clearing and grubbing, grading, excavating, transporting and filling of land, or other changes of the land surface including removing vegetative or impervious cover.

Minneapolis Storm Water Management Design Manual --See Section 54.30.

Mitigation is avoiding, minimizing, rectifying, or compensating for impacts.

Non-structural best management practices --See Best Management Practices.

Owner is any person with a legal or equitable interest in the land that includes one (1) or more storm water management constructed facilities.

Person is any individual, firm, corporation, partnership, franchisee, association or governmental entity.

Phased or connected actions are as defined by Minnesota Environmental Review Rules, as follows:

(1) *Phased action* means two (2) or more projects to be undertaken by the same proposer that the city engineer determines:

a. will have environmental effects on the same geographic area, and
b. are substantially certain to be undertaken sequentially over a limited period of time.

(2) *Connected actions:* Two (2) projects are "connected actions" if the city engineer determines they are related in any of the following ways:

a. one (1) project would directly induce the other;
b. one (1) project is a prerequisite for the other; or
c. neither project is justified by itself.

Pollution is the human-made or human-induced alteration of the chemical, physical, biological or radiological integrity of an aquatic ecosystem.

Project is an undertaking that involves land disturbing activities, including phased or connected actions.

Public waters are waters identified under Minnesota Statutes, Section 103G.005, Subdivision 15.

Receiving water body is the initial lake, stream, river, or wetland into which site runoff is conveyed whether directly or through the public storm drain system.

Regional storm water facility is a natural or built structure or device within the project's receiving water body drainage area, when so designated by the city engineer.

Responsible party is the property owner and agents, employees, and others acting under the property owner's direction.

Retention facility is a natural or built structure that provides for the storage of storm water runoff by means of a permanent pool of water.

Runoff is rainfall, snowmelt, or irrigation water flowing over the ground surface.

Sediment is soils or other surficial materials transported by surface water as a product of erosion.

Site is the land on which the project, including phased or connected actions, is located.

Site plan is a plan or set of plans showing the details of any land disturbing activity including, but not limited to, the construction of structures, open and enclosed drainage facilities, storm water management facilities, parking lots, driveways, curbs, pavements, sidewalks, bike paths, recreational facilities, ground covers, plantings, and landscaping.

Soil is naturally occurring surficial deposits overlying bedrock.

Storm Water Best Management Practices (BMPs) are practices, techniques, or measures which are proven to be effective in managing one (1), or more than one (1), of the following: storm water runoff rate, storm water runoff volume, pollutants conveyed by storm water runoff, sediment conveyed by storm water runoff. Best management practices include, but are not limited to, official controls, structural and nonstructural best management practices, and operation and maintenance procedures. A partial list of structural best management practices and devices includes pond systems/detention basins, infiltration, bioretention and vegetated channels, grit chambers, oil/water separators, filtration systems, and diversions. A partial list of non-structural best management practices includes lawn care education, organic litter management, street sweeping, catch basin stenciling, and catch basin cleaning. BMPs are further defined in the design manual.

Storm water hotspot is a land use or activity that generates higher concentrations of hydrocarbons, trace metals or toxicants than are found in typical storm water runoff.

Storm water management is the collection, conveyance, storage, treatment and disposal of storm water runoff in a manner to minimize channel erosion, flood damage, or degradation of water quality and in a manner to protect and enhance the environment, public health, safety, and general welfare.

Storm water management devices include, but are not limited to, constructed wetlands, wet ponds, wet extended detention ponds, pocket ponds, multiple pond systems, settling basins, infiltration trenches or basins, filter systems bioretention areas, dry or wet swales, grass channels, waterways, rooftop detention, skimming devices, grit chambers, sweeping, and diversions.

Storm water management goals are based on the receiving water body and emphasize overall volume reduction, nutrient reduction for storm water discharge to lakes, rate control for storm water discharge to streams, and suspended solids removal for storm water discharge to the Mississippi River.

Storm Water Management Plan (Plan) is the set of drawings, calculations, and other documents that comprise all of the information and specifications for the drainage systems, structures, concepts and techniques that will be used to control storm water as required by this ordinance and the design manual.

Storm water pond is a facility capable of holding water on a long-term seasonal or permanent basis (retention), or a short-term basis (detention), the purpose of which is to collect runoff, nutrients, and sediment prior to releasing water into wetlands, lakes, streams, and rivers.

Storm water runoff is the direct response of a watershed to precipitation or snowmelt and includes runoff that enters a ditch, stream, storm drain or other concentrated flow.

Structural best management practices --See Storm Water Best Management Practices.

Structure is anything manufactured, constructed or erected that is normally attached to or positioned on the land, including portable structures, roads, parking lots, and paved storage areas.

Water quality refers to those characteristics of storm water runoff that relate to the physical, chemical, biological, or radiological integrity of water.

Water quantity refers to those characteristics of storm water runoff that relate to rate and volume.

Watershed is the drainage area contributing storm water runoff to a specific receiving body of water or watercourse such as a lake, creek, or river.

Wetlands are waters identified under Minnesota Statutes, Section 103G.005, Subdivision 19. (99-Or-156, § 1, 11-24-99; 2006-Or-052, § 1, 5-12-06)

54.50. Applicability. Chapter 54 establishes requirements for land disturbing activities

on-sites greater than one (1) acre including phased or connected actions, and for existing storm water constructed devices.

(1) *Land-disturbing projects.* All land-disturbing projects on sites in excess of one (1) acre, including phased or connected actions, shall be served by storm water facilities, on or off site or a combination thereof, designed to meet or exceed targets according to the type of receiving water body as prescribed in the design manual. Land use and building permits will not be issued until a Storm Water Management Plan has been approved. On-site devices are subject to annual site registration, annual inspection, and adherence to maintenance rules prescribed in the design manual.

(2) *Pre-existing storm water management constructed devices.* Storm water facilities in existence prior to Chapter 54 are subject to annual site registration, annual inspection, and adherence to maintenance rules prescribed in the design manual. (99-Or-156, § 1, 11-24-99)

54.60. Exemptions. The following activities are exempt from requirements of Chapter 54:

(1) Storm water management plan requirements of Chapter 54.50(1) for any project that has received all necessary approvals from the city on or before the effective date of this ordinance.

(2) Emergency work to protect life, limb, or property.

(3) Any reconstruction project of an existing roadway, bridge, pathway or walkway where the increase in impervious surface area is one (1) acre or less.

(4) Installation of fence, sign, telephone, electric or other kinds of posts or poles. (99-Or-156, § 1, 11-24-99)

54.70. Responsibility prior to construction. Land use and building permits will not be issued until a Storm Water Management Plan has been approved.

(1) *Storm Water Management Plan application and approval.* The procedure for application for Storm Water Management Plan approval by the city engineer is contained in the design manual.

a. *Manual.*

1. *On-site management.* Measures to achieve storm water management standards should be incorporated on all sites to the greatest extent possible.

2. *Full or partial off-site management (participation in a regional facility).* When due to development density, topographic features, or soil or vegetation conditions, the responsible party may apply for approval of full or partial participation in existing regional storm water facilities within the drainage area of the same receiving water body, or regional storm water facilities within the drainage area of the same receiving water body that are substantially certain to be developed, or, if none exist, other storm water mitigation programs in the City of Minneapolis. The design manual shall provide the method for calculating cost of full or partial off-site management in lieu of full on-site management. Off-site management may not circumvent the general purposes and intent of this ordinance.

3. *Storm water management standards.*

i. *Standards according to receiving waterbody.* Storm water management standards include, but are not limited to, reduction of suspended solids discharged to the Mississippi River, controlled rate of discharge to streams, and reduction of nutrients in storm water draining to lakes or wetlands. Minimum requirements for pollutant removal including total suspended solids removal, discharge rate control, and nutrient load reduction according to type of receiving water body are prescribed in the design manual.

ii. *Storm water management devices.* When development density, topographic features, and soil and vegetation conditions are not sufficient to adequately handle storm water runoff using natural features and vegetation, constructed facilities or combinations of constructed facilities

shall be used. Types of constructed facilities include, but are not limited to, wetlands, wet-ponds, wet extended detention ponds, pocket ponds, multiple pond systems, setting basins, infiltration trenches or basins, filter systems, bioretention areas, dry or wet swales, grass channels, waterways, rooftop detention, skimming devices, grit chambers, sweeping and diversions. Suitability factors include, but are not limited to, development density, underlying soils, existing vegetation, drainage, location of utilities, aesthetic and recreational use, and management considerations.

iii. *Minimizing land disturbance.* Development shall be planned and conducted in a manner that will minimize the extent of disturbed areas, runoff velocities, erosion potential, and reduce and delay runoff volumes. Disturbed areas shall be stabilized and protected as required in Chapter 52 of this Code.

iv. *Maximizing infiltration.* To the greatest possible degree (except in the case of storm water hotspots), natural drainage ways and vegetated soil surfaces should be used to convey, store, filter, and retain storm water before discharging runoff into public waters or the public storm drain system. Opportunities for maximizing infiltration include minimizing the extent of impervious surfaces and directing runoff from impervious surfaces and from roof gutter systems onto lawns or other pervious surfaces.

v. *Rate control.* Changes in land cover effect changes in storm water runoff rates. Rate increases can degrade receiving water bodies or conveyance facilities or can cause flooding. Development should be planned in a manner that does not increase peak flows.

vi. *Ongoing maintenance.* No storm water facilities shall be approved without a maintenance plan that defines the maintenance regimen, including type and interval of maintenance and party to conduct such maintenance.

vii. *Accessibility for maintenance.* All public and private owned storm water management facilities shall provide an unobstructed access path capable of supporting light truck traffic during normal weather for the purpose of conducting inspections of the facility and maintenance thereof, unless waived by the city engineer.

viii. *Easement.* No storm water facility shall be approved unless all necessary access easements are provided to the City of Minneapolis.

ix. *Impacts on other properties.* No Storm Water Management Plan shall be approved without written agreement among affected property owners regarding changes in drainage or other impacts or possible impacts of storm water management.

x. *Conformity with other requirements.* Storm Water Management Plans must conform to all applicable federal, state, city, and water management organization statutes, ordinances, and regulations.

4. *Conditions of approval.* In granting any approval pursuant to Chapter 54, the city engineer may impose such conditions as may be reasonably necessary to prevent creation of a nuisance or unreasonable hazard to persons or to a public or private property. Such conditions shall include (even if not specifically written in the Plan), but need not be limited to the granting (or securing from others) and recordation in county land records of easements for drainage facilities, including the acceptance of their discharge on the property of others, and for the maintenance of facilities.

5. *Denial.* If the city engineer determines that the Storm Water Management Plan does not meet the requirements of Chapter 54, the Plan will not be approved. A revised Storm Water Management Plan must be resubmitted and approved before any land disturbing activity begins. All land use and building permits must be suspended until the applicant has an approved Storm Water Management Plan.

6. *Appeal.* Any affected party may appeal any Storm Water Management Plan decision by an issuing authority to the Planning Commission. Appeal of the issuing authority's decision shall follow the procedures established in the Minneapolis Zoning Code, Section 525.160. (99-Or-156, § 1, 11-24-99)

54.80. Responsibility during construction/completion. (a) *Duration.* The applicant shall fully perform and complete all of the work within one (1) year or as otherwise specified in the Plan and approved.

(b) *Renewals/extensions.* Prior to the end of the approved schedule, the applicant may present a written request for an extension to the city engineer. If, in the opinion of the city engineer, an extension is warranted, an extension may be granted not to exceed one (1) year.

(c) *Changes to plans.* Any modifications to an approved Storm Water Management Plan must be approved by the city engineer.

(d) *Conformity with the plan.* The applicant shall, at all times, be in conformity with the approved Storm Water Management Plan.

(e) *Construction/completion final report and certification.* The applicant shall submit a final report to the city engineer for certification of completion. (99-Or-156, § 1, 11-24-99)

54.90. Responsibility following construction/completion. (a) *Duration.* An approved storm water management plan shall remain in effect unless cancellation is approved by the city engineer. All site areas used for the purpose of flood storage or treatment of storm water runoff shall be preserved and maintained for that use, including areas required for maintenance and inspection.

(b) *Changes to plans.* A responsible party can request modifications to an approved storm water management plan, and the issuing authority can order modifications to an approved storm water management plan. Any modification to an approved storm water management plan must be approved by the city engineer.

(c) *Annual notification.* The assistant city coordinator of regulatory services shall annually notify responsible parties of storm water management devices of the need to register, that the devices are subject to annual inspection, and to conduct maintenance on a one (1) year interval or in accordance with maintenance plans on file.

(d) *Annual site registration.* Any person(s), organization, company, group, or any other entity, public or private, in control of storm water management devices installed under this ordinance or existing prior to this ordinance shall register that site annually with the assistant city coordinator of regulatory services, remit an annual registration fee at the rate as established in Appendix J, License Fees Schedule per storm water management device. Submission and payment confirm that the site's storm water management devices have been inspected, maintained and are functioning satisfactorily. The annual fee shall be due and payable on January 31st of each year. If registration is not received or postmarked on or before January 31st of each year, the applicant shall pay late fees provided for such registration. Failure to obtain the appropriate permit prior to discharging will result in a doubling of fees. Each day of failure to maintain or obtain registration may constitute a separate violation of this Code.

(e) *Annual inspection of storm water facilities.* All storm water management devices are subject to annual inspection by the assistant city coordinator of regulatory services. If the city engineer or assistant city coordinator of regulatory services deems that devices are not functioning satisfactorily, a notice of noncompliance may be issued and procedures followed as described in Section 54.90(f)(2).

(f) *Maintenance of storm water constructed facilities.*

(1) *Regular maintenance.* Regular maintenance of storm water management constructed facilities in accordance with the approved plan shall be required unless the plan is modified and approved by the city engineer ([section] 54.90(2)). All facilities shall be maintained in proper condition for sustained use, consistent with the performance standards for which they were originally designed.

a. All settled materials from ponds, sumps, grit chambers, and other devices, including settled solids, shall be removed and properly disposed of.
b. All planted materials integral to storm water facility performance, safety, and/or aesthetic quality shall be maintained in proper condition consistent with design performance standards, including replacement when necessary.
(2) *Action upon non-compliance.* In the event maintenance does not conform to the approved plan or to any instructions of the issuing authority, notice to comply shall be given to the responsible party in writing. After a notice to comply is given, in the determination of the issuing authority, the responsible party shall be required to make the corrections within the time period determined by the issuing authority. If an imminent hazard exists, the issuing authority may require that the corrective work begin immediately. Failure of the responsible party to comply with the directives of section 54.90(f)(1) will constitute a violation pursuant to section 54.90(f)(2), and the issuing authority may proceed with the necessary maintenance of the site at the expense of the responsible party. The responsible party will be billed for the expenses incurred by the issuing authority. Failure to pay will result in the issuing authority seeking recovery of costs and damages pursuant to the conditions set forth in section 54.120. (99-Or-156, § 1, 11-24-99; 2006-Or-052, § 2, 5-12-06; Ord. No. 2009-Or-019, § 1, 3-6-09)

54.100. Liability. The responsible party is responsible for safe and legal compliance with Chapter 54. Neither approval under the provisions of Chapter 54, nor the compliance with the provisions hereto or with any condition imposed by the issuing authority, shall relieve any person from responsibility for damage to persons or property resulting therefrom, or as otherwise imposed by law, nor impose any liability upon the city for damages to persons or property. (99-Or-156, § 1, 11-24-99)

54.110. Administration and enforcement. The issuing authority shall be responsible for the administration and enforcement of Chapter 54. Land use and building permits will not be issued until a Storm Water Management Plan has been approved. The issuing authority may post a stop work order if any land disturbing activity regulated under Chapter 54 is being undertaken without an approved Storm Water Management Plan or if any of the conditions of the Storm Water Management Plan are not being met. (99-Or-156, § 1, 11-24-99)

54.120. Penalties. Any person, firm, corporation or agency acting as property owner, responsible party, or otherwise, who fails to comply with the provisions of this Chapter 54 shall be guilty of a misdemeanor. (99-Or-156, § 1, 11-24-99)

54.130. Interpretation. In their interpretation and application, the provisions of this ordinance shall be held to be minimum requirements and shall be liberally construed in favor of the city and shall not be deemed a limitation or repeal of any other powers granted by state statutes. (99-Or-156, § 1, 11-24-99)

54.140. Severability. If any section, clause, provision or portion of this chapter is adjudged unconstitutional or invalid by a court of competent jurisdiction, the remainder of the chapter shall not be affected thereby. (99-Or-156, § 1, 11-24-99)

54.150. Disclaimer. This chapter does not imply that areas will be free from flooding or flood damages. This chapter does not create liability on the part of the city or its officers

or employees for any flood damage that may result from reliance on this chapter or any administrative decisions made under it. (99-Or-156, § 1, 11-24-99)

54.160. Abrogation and greater restrictions. It is not intended by this chapter to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this chapter imposes greater restrictions, the provisions of this chapter shall prevail. All other ordinances inconsistent with this ordinance are hereby repealed to the extent of the inconsistency only. (99-Or-156, § 1, 11-24-99)

54.170. Relation to other laws. Neither Chapter 54 nor any administrative decision made under it exempts the applicant or any other person from procuring other required permits or complying with the requirements and conditions of such permits, or limits the right of any person to maintain, at any time, any appropriate action, at law or in equity, for relief or damages against the applicant or any other person arising from activity regulated by Chapter 54. (99-Or-156, § 1, 11-24-99)

54.180. Effective date. This ordinance shall become effective on January 1, 2000. (99-Or-156, § 1, 11-24-99)

3.0 Member Authorities and Responsibilities

The MWMO will work with member organizations and other water-related authorities to implement the goals and strategies of this Plan. Coordination between the MWMO and member organizations requires that each organization has a clear role. This section of the Plan clarifies these roles by describing the MWMO's expectations of each authority in the areas of MWMO's Standards, members' Local Water Management Plans, all water-related authorities in the MWMO, and MWMO Funding.

3.1 Adopting MWMO's Standards

The MWMO recognizes that the control and determination of appropriate land uses is the responsibility of the Local Units of Government. Since the MWMO is responsible for the protection and management of surface and groundwater systems, it is well equipped to develop resource-based standards (MWMO Standards) that will best address the impact of the surrounding land use on the quality of these resources. The MWMO does not issue permits or provide approval letters for construction projects; rather, it relies on the existing permitting and enforcement bodies of its member organizations. To continue this efficiency in government, the MWMO prefers to have member organizations integrate the implementation and enforcement of MWMO Standards into their existing regulatory departments (see Appendix F). The MWMO is ready to assist its member organizations by providing additional staff expertise and funding for the writing of these standards into ordinance. The following standards have been written with the acknowledgement that more details may need to be added as the city ordinances are written.

3.1.1 Volume Control in Urban Areas

It is clear, given the recent, discussions with our member organizations and the Minnesota Department of Transportation, that the MWMO's highly urban setting and non-native soils creates concerns over the viability of volume controls for stormwater management. Our members have stated there are few, if any, parcels suitable for infiltration in the MWMO and that volume control best practices are not cost effective and efficient. As such, requiring developers to design for a volume standard would result in infeasible or cost prohibitive public and private projects. In addition, there are currently a number of significant studies underway to in the Twin Cities Metropolitan Area and in other parts of the country to better define the reasonableness of a volume standard in highly urbanized settings.

The MWMO acknowledges these are concerns that need to be addressed as we continue to move forward toward a volume standard. The MWMO believes a volume standard is necessary to maintain the health of the water resources, meet the loading reductions required, and to maintain the longevity of the pipeshed system. Volume control is beneficial for many reasons. Volume practices have the highest efficiency in removal of pollutants and the remove the greatest numbers pollutants. Volume controls prevent attenuate peak flows, i.e. increased periods of discharge, within the pipeshed, which maintains the existing pipeshed capacity and may reduce longterm maintenance costs on the pipeshed system.

Given the discussions and the addition studies underway, the MWMO has agreed to: delay the implementation of a volume control standard within the Watershed; conduct additional studies to determine how urban redevelopment conditions found in the MWMO will affect the viability and potential form of the volume control standard; and wait for further results from two current studies underway before finalizing a volume standard. The first study is the Minnesota Pollution Control Agency's Minimal Impact Development Study, a comparison of new development volume standards; and the second is the Environmental Protection Agency's consideration of volume treatment requirements and whether volume, in and of itself, should be considered a pollutant.

The MWMO will complete the following studies and reviews: the MWMO will partner with member communities to identify opportunity areas for regional and site level abstraction throughout the watershed; the MWMO will review Tom Schueler's Technical Bulletin No. 5. Stormwater Design for High Intensity Redevelopment Projects; the MWMO will analyze the effectiveness and cost associated with stormwater volume control via techniques that amend soils and disconnecting impervious surfaces; the MWMO will research new

stormwater best management practices and related operations and maintenance issues; and the MWMO will conduct a feasibility study that will propose a volume incentive and a single water quality standard.

During the interim period (1 to 2.5 years) MWMO members and the Minnesota Department of Transportation have commitment to meet and discuss aspects of a future volume standard appropriate for the MWMO's urban watershed setting. Furthermore, once a standard is adopted by the MWMO, members and the Minnesota Department of Transportation have agreed to update their local controls or project design standards to comply with the MWMO's standard. The revisions and a local adoption shall be completed within a period of 180 days from the approved changes to the MWMO's Plan. The MWMO's volume standard will be adopted and implemented within 3 years of the MWMO's Third Generation Plan's final approval.

3.1.2 Limiting Costs of Stormwater Treatment

Initially, stormwater best management practices were designed to meet conditions found in new growth areas, outside of urban core, where there were few limiting conditions to site development. However, in highly urbanized areas, where property may have had multiple land uses and been redeveloped many times there is a great likelihood there will be factors that limit certain types of best management practices to manage stormwater. Thus, when the same best management practices are fitted to the urban core the costs may rise significantly due to site conditions; such as, higher land values, polluted soil conditions, inappropriate fill or placement of existing infrastructure. Therefore the MWMO may set limits on cost of stormwater treatment any site incurs in complying with the MWMO's Standards. A limit of the stormwater costs is needed to balance the environmental and financial tradeoffs to the public and private sectors to achieve the protection and restoration of the water quality and quantity in the watershed.

On occasion, the limiting conditions on urban sites may inflate the cost of site stormwater treatment to a level that exceeds what is reasonable to expect, so the MWMO will consider shifting the treatment to the next best site opportunity elsewhere in the watershed or further upstream. The opportunity lost, when this shift occurs, is the management of stormwater as close as possible to its source. Source management of stormwater is the preferred option for replicating a watershed's natural hydrologic cycle, limiting pollutant concentrations, and preventing higher downstream clean up costs.

Each year, at its annual meeting in January, the MWMO Board will review and set the limit for the cost of stormwater management to comply with the MWMO's Standards. The developer will need to demonstrate (via a feasibility study) that the cost limit set by the MWMO will be exceeded given site conditions. If the developer's findings are verified by the member's permitting staff and the MWMO the developer, public or private, may proceed to the alternative compliance options for the standard in question.

3.1.3 The MWMO's Standards Language

Note: The MWMO will be working with agencies and its member organizations over the next 2.5 years to revise or determine new water quality and volume standards.

1. **Stormwater Management Standards**
   - **a.** Any project creating greater than one acre of land disturbance is subject to the standards below.
   - **b.** The MWMO's Standards, or higher, must be adopted by local units of government and incorporated into their stormwater ordinance or other regulatory control.
   - **c.** In order to reduce regulatory complexity, a member may request the MWMO to allow stormwater rules set forth by adjacent watershed management organizations to govern development so long as they can be shown to be substantially equal to or greater than the level of protection afforded by the MWMO Standards.
   - **d.** Road mill and overlay project activities need only to comply with MWMO erosion and sediment control standards.
   - **e.** Projects involving installation of signs, lighting, signals, fence, noise walls, storm sewers, culverts, manholes and catch basins may be exempt from stormwater standards, if it can be demonstrated to the permitting entity and MWMO that the hydraulic and hydrologic capacity of soils to infiltrate and practices to convey water on site are the same or better than existed prior to the start of the project. The project will need to comply with MWMO erosion and sediment control standards.
   - **f.** The MWMO's Incentivized Standards set goals that achieve higher quality water resources in the MWMO. Only projects seeking funding from the MWMO need to consider these goals (see 3.1.4 The MWMO's Incentivized Standards**)**.

2. **Rate Control**
   - **a.** Runoff rates for the proposed activity shall not exceed pre-development runoff rates for the Type II distribution 2-, 10-, and 100-year critical storm events (as defined by TP-40 and/or subsequent revisions – see Table 3).
   - **b.** Runoff rates may be restricted to less than the pre-development rates when the capacity of the downstream conveyance system is limited.
   - **c.** The following pre-development curve numbers shall be used to evaluate this standard:

Hydrologic Soil Group	Curve Number
A	49
B	69
C	79
D	84

   - **d.** For rate control stormwater calculations a geotechnical evaluation is required to characterize the soils when site soils are shown as "Urban" in the latest version of the NRCS soil survey.

3. **Water Quality**
   - **a.** Projects shall achieve a removal of 90% TSS (Total Suspended Solids) from the 95th percentile daily rainfall total (currently 1.17 inches in 24hrs) over the entire area of the site (not just areas of the site being developed or disturbed).

4. **Volume (placeholder for future volume standard by ~ 2013)**

5. **Water Quality Alternative Compliance**

The following alternative compliance section is for sites that are not able to meet the MWMO's water quality standard for total suspended solids (TSS).

a. Common requirements for both public and private entities

- **i.** Only need to meet the MWMO standard once for a given site no double accounting where treatment or exemptions have occurred in the past
- **ii.** Practices must perform to MWMO's Standards. Developers must follow an inspection and maintenance schedule that has been approved by the permitting entity and correct any post construction performance issues that arise.
- **iii.** May pay a TSS lbs/ acre fee to cover the capital, maintenance, and replacement cost of a alternate or regional treatment facility
  - **1)** Fees should represent the true cost of: upfront capital costs; the operational and maintenance costs (lifecycle costs) of the practice.
  - **2)** Fees collected for regional treatment must be dedicated to stormwater management practices that remove the pollutants a fee is paid for. Cities will report to the MWMO annually on the stormwater account's revenues, expenditures and balance as well as the amount, type and location of where treatment has been added.

b. Common requirements for all MS4's and governmental organizations

- **i.** May accumulate IOU credits for the required pounds of TSS / acre that cannot be treated on the project site
  - **1)** The MWMO requires annual reporting of IOU credit balances. The report will be a record of the annual credit total, and site locations with the amount of credits accrued or debited.
  - **2)** All IOU credits need to be debited (used up) within five years of their inception or the approval of new permits may be held up.
  - **3)** May exchange IOU credits for excess regional treatment they have built
    - **i)** IOU's exchanged for regional treatment must be dedicated to stormwater management practices that remove the pollutant an IOU is charged for. Cities will report to the MWMO annually on the stormwater account's credits, debits and balance as well as the amount, type and location of where treatment has been added.
  - **4)** Trees in tight corridors may be used as a potential offset to meeting standards when water is directed to them and their benefits to volume, rate and water quality treatment can be quantified.

c. Exclusive conditions pertaining to MWMO member organizations

- **i.** IOU credits may be debited (used up) on other project sites within the MWMO and on upstream projects sites within the member's jurisdictional boundaries
  - **1)** Prior to the MWMO approving the use of IOU's outside of the watershed, member organizations will need to provide:
    - **a)** A feasibility study or demonstration of a site's limiting conditions that prevent complying with the MWMO's standard onsite
    - **b)** An evaluation of the member's future projects in the MWMO that demonstrates IOU credits cannot be debited (used up) on another project within a period of five years

c) For projects outside of the watershed, the MWMO's remaining treatment will be in addition to any local site volume, rate and water quality requirements

d. Exclusive conditions pertaining to the Minnesota Department of Transportation

i. Due to Minnesota Department of Transportation's right of way and land limitations within the MWMO, they may debit (used up) their IOU on other project sites within the MWMO and on upstream projects sites within the metro area

1) Prior to the MWMO approving project sites outside of the watershed, the Minnesota Department of Transportation will need to provide:

a) A feasibility study or demonstration of a site's limiting conditions that prevent complying with the MWMO standard onsite

b) An evaluation of future Minnesota Department of Transportation projects in the MWMO that demonstrates IOU credits cannot be debited (used up) on another project within a period of five years

2) Projects outside of the MWMO and its member organizations' boundaries shall only install volume control practices to meet the MWMO's water quality standard (see Volume Control Guidance under #7 below)

3) For projects outside of the watershed, the MWMO's remaining treatment will be in addition to any local site volume, rate and water quality requirements

4) Trees in tight corridors may be used as a potential offset to meeting standards when water is directed to them and their benefits to volume, rate and water quality treatment can be quantified. Trees may be installed per Mn/DOT Design Standards.

e. Exclusive conditions pertaining to private development project sites

i. Redevelopment timing accommodations for meeting water quality standards can be made by the permitting entity in their ordinance or rules for some phased redevelopment situations. IE: Stormwater treatment may not be required until the third phase of a shopping mall development or a certain revenue milestone in the development has been met.

ii. Private developers may transfer of TSS lbs/ acre between concurrent projects in the MWMO, if compliance with the MWMO standard cannot be met on the project site.

1) Prior to the permitting entity approving the transfer of TSS lbs/ acre between concurrent projects private developers will need to provide:

a) A feasibility study or demonstration of the donor site's limiting conditions that prevent complying with the MWMO's standard onsite

b) A feasibility study or demonstration that the host site will be able to accommodate the transferred amount for treatment in addition to any local site volume, rate and water quality treatment requirements.

2) Treatment for the transferred TSS lbs/ acre must be installed and operational on the host site prior to a final occupancy approval of the donor site

6. Volume Control Guidance (recommended procedures for volume control projects)

a. Infiltration volumes and facility sizes shall be calculated using the appropriate hydrologic soil group classification, ASTM Unified Soil Class Symbol and design infiltration rate from Table B. Select the design infiltration rate from Table B based on the least permeable soil horizon within the first five feet

below the bottom elevation of the proposed infiltration best management practice. The information provided in Table B is intended to be used in the following manner:

i. For preliminary design purposes, refer to the NRCS soil survey to identify the hydrologic soil groups found on site. This information provides a preliminary indication of the infiltration capacity of the underlying soils.

ii. After volume control/infiltration practices have been located on the grading plans, perform soil borings in the exact location of the proposed practices as described in the Minnesota Stormwater Manual (Minnesota Pollution Control Agency, 2008a) as amended. Soil borings should be logged using the USDA Soil Textural Classification System and the ASTM Unified Soil Class Symbol.

iii. The combination of all the aforementioned information will allow the designer to identify the appropriate design infiltration rate. As the Minnesota Stormwater Manual States, "these infiltration rates represent the long-term infiltration capacity of a constructed infiltration practice and are not meant to exhibit the capacity of the soils in the natural state". A permit applicant can submit field measurements and revised rates (using the correction factors provided in the Minnesota Stormwater Manual) if there is reason to believe the long-term infiltration rates will be other than the design infiltration rates provided in Table B.

b. A geotechnical investigation shall be performed in the location of the proposed volume control practices to confirm or determine underlying soil types, the depth to the seasonally high groundwater table, and the depth to bedrock or other impermeable layer.

c. The infiltration area shall be capable of infiltrating the required volume within 48 hours for surface and subsurface BMPs.

d. Infiltration BMPs must be designed to provide adequate pretreatment measures before discharge of runoff to the primary infiltration area.

e. Design and placement of infiltration BMPs shall be done in accordance with the Minnesota Department of Health guidance called "Evaluating Proposed Stormwater Infiltration Projects in Vulnerable Wellhead Protection Areas." (Final version to govern)

f. To calculate stormwater runoff under post-development conditions, the area of the site disturbed during construction shall be assigned a runoff curve number (CN-value) corresponding to a soil permeability class one step below that of the undisturbed soil unless the project approval from the city specified an approved method to restore the soil structure.

g. Specific site conditions may make infiltration difficult, undesirable, or impossible. Some of these conditions are listed in Table A.

Table A. Site Conditions Considered Undesirable for Infiltration BMPs

Type	Specific Site Conditions	Submittal Requirements
Potential Contamination	Potential Stormwater Hotspots (PSHs)	PSH locations and flow paths
	Contaminated Soils	State Permitted Brownfield Documentation, Soil Borings
Physical Limitations	Low Permeability (Type D Soils)	Soil Borings
	Bedrock within 3 vertical feet of bottom of infiltration area	Soil Borings
	Seasonal High Groundwater within 3 vertical feet of bottom of infiltration area	Soil Borings
	Karst Areas	Soil Borings
	Steep Slopes	Steep Slope Determination
Land Use Limitations	Utility Locations	Site Map
	Adjacent Wells	Well Locations

	Building Foundation	Ten (10) feet
Source: Modified from Capitol Region Watershed District Rules, Revised 03/05/2008		

TABLE B. Design Infiltration Rates			
Hydrologic Soil Group	**Soil Textures[1]**	**ASTM Unified Soil Class Symbols**	**Rate**
A	Gravel, sand, sandy gravel, silty gravel, loamy sand, sandy loam	GW, GP	1.63 in/hr
		GM, SW, SP	0.80 in/hr
B	Loam, silt loam	SM	0.60 in/hr
		ML, OL	0.30 in/hr
C	Sandy clay loam	GC, SC	0.20 in/hr
D	Clay, clay loam, silty clay loam, sandy clay, silty clay	CL, CH, OH, MH	0.00 in/hr
Source: Modified from Minnesota Stormwater Manual, November 2005			

[1] Adapted from the U.S. Department of Agriculture, Natural Resources Conservation Services, 2005. National Soil Survey Handbook, title 430-VI.

7. Maintenance

a. All stormwater management structures and facilities, including volume reduction BMPs, shall be maintained to assure that the structures and facilities function as originally designed. The maintenance responsibilities must be assumed by either the municipality's acceptance of the required easements dedicated to stormwater management purposes, or by the applicant executing and recording a maintenance agreement. The recordable executed agreement must be submitted to the municipality prior to issuance of the project approval from the city. Public developments will require a maintenance agreement in the form of a Memorandum of Agreement or an approved Local Water Management Plan that details the methods, schedule, and responsible parties for maintenance of stormwater management facilities for permitted development. A single Memorandum of Agreement for each local government unit may be used to cover all stormwater management structures and facilities required herein, including volume reductions BMPs, within the LGU's jurisdiction. This maintenance plan shall address snow management.

8. Drainage Alterations

a. No person shall alter stormwater flows (resulting in an increase in stormwater flows or a change in existing flow route) at a property boundary by changing land contours, diverting or obstructing surface or channel flow, or creating a basin outlet, without first obtaining a permit from the city.

9. Bounce and Duration Control

a. The project must meet hydroperiod standards adapted from "Stormwater and Wetlands Planning and Evaluation Guidelines for Addressing Potential Impacts of Urban Stormwater and Snowmelt Runoff on Wetlands," (Minnesota Stormwater Advisory Group, June 1997), as follows:

i. Wetland Susceptibility Class = Highly Susceptible; Permit Storm Bounce = Existing; Inundation Period for 2-Year event = Existing; Inundation Period for 10-year or Greater Event = Existing

ii. Wetland Susceptibility Class = Moderately Susceptible; Permit Storm Bounce = Existing plus 0.5 feet; Inundation Period for 2-Year event = Existing plus 1 days; Inundation Period for 10-year or Greater Event = Existing plus 7 days

iii. Wetland Susceptibility Class = Slightly Susceptible; Permit Storm Bounce = Existing plus 1.0 feet; Inundation Period for 2-Year event = Existing plus 2 days; Inundation Period for 10-year or Greater Event = Existing plus 14 days

iv. Wetland Susceptibility Class = Least Susceptible; Permit Storm Bounce = No Limit; Inundation Period for 2-Year event = Existing plus 7 days; Inundation Period for 10-year or Greater Event = Existing plus 21 days

10. Flood Control

a. All habitable buildings, roads, and parking structures on or adjacent to a project site shall comply with the following flood control and freeboard requirements:

i. Condition = New Habitable Buildings; Waterbodies with Piped Outlets and Mississippi River = Low floor must be a minimum of 2 feet above the 100-year flood elevation; Waterbodies without Piped Outlets = Low floor must be a minimum of 5 feet above the 100-year flood elevation; Subsurface Stormwater Management BMPs = Low floor must be a minimum of 2 feet above the 100-year flood elevation or 1 foot above the emergency overflow elevation unless floodproofing measures are constructed with the building; and Low opening must be a minimum of 2 feet above the 100-year flood elevation or 1 foot above the emergency overflow elevation.

ii. Condition = Existing Habitable Buildings (only for projects with >90% tear down) – Adjacent to and Potentially Affected by Flood Waters; Waterbodies with Piped Outlets and Mississippi River = Low opening must be a minimum of 2 feet above the 100-year flood elevation; Waterbodies without Piped Outlets = Low opening must be a minimum of 5 feet above the 100-year flood elevation; Subsurface Stormwater Management BMPs = Low floor must be a minimum of 2 feet above the 100-year flood elevation or one foot above the emergency overflow elevation unless floodproofing measures are constructed with the BMP; and Low opening must be a minimum of 2 feet above the 100-year flood elevation or 1 foot above the emergency overflow elevation.

iii. Condition = Underground Parking Structures; Waterbodies with Piped Outlets and Mississippi River = Low opening must be a minimum of 2 feet above the 100-year flood elevation; Waterbodies without Piped Outlets = Low opening must be a minimum of 2 feet above the 100-year flood elevation; Subsurface Stormwater Management BMPs = Low opening must be a minimum of 2 feet above the 100-year flood elevation or 1 foot above the emergency overflow elevation unless floodproofing measures are constructed with the BMP.

iv. Condition = Public Roadway; Waterbodies with Piped Outlets and Mississippi River = Roadway shall not flood when adjacent to Stormwater storage basin designed to store the 100-year storm event. Freeboard requirement set by road authority; Waterbodies without Piped Outlets = Roadway shall not flood when adjacent to stormwater storage basin designed to store the 100-year storm event. Freeboard requirement set by road authority; Subsurface Stormwater Management BMPs = Roadway shall not flood when adjacent to stormwater storage basin designed to store the 100-year storm event. Freeboard requirement set by road authority.

v. As an alternative, for Stormwater Management BMPs (BMP) designed to store significant runoff, the minimum freeboard requirement above the 100-year high water level may be calculated as the height determined by adding the depth over the Stormwater Management BMP above the 100-year high water level of the volume of runoff received by the BMP from a two year event.

11. Erosion and Sediment Control

a. Erosion and sediment control measures shall meet the standards for the General Permit Authorization to Discharge Stormwater Associated with Construction Activity Under the National Pollutant Discharge Elimination System/State Disposal System Permit Program, Permit MN R100001 (NPDES General Construction Permit), issued by the Minnesota Pollution Control Agency, except where more specific requirements are required.

b. Activity shall be phased to minimize disturbed areas subject to erosion at any one time.

c. All construction site waste—such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site—shall be properly managed and disposed of so they will not have an adverse impact on water quality.

d. Silt fence shall conform to sections 3886.1 and 3886.2, Standard Specifications for Construction, Minnesota Department of Transportation (2005 ed.), as it may be amended.

3.1.4 The MWMO's Incentivized Standards

All Member Grant, Greening and capital projects funded by the MWMO will need to meet the Standards defined in section 3.1.3 The MWMO's Standards Language. In addition, funding requests for capital projects that go

beyond MWMO's required standards and work towards achieving the following rate, water quality and volume goals will benefit during the MWMO's project selection process.

1. **Rate Control Goal**
   - **a.** Runoff rates shall not exceed historic runoff rates for the Type II distribution 2-, 10-, and 100-year critical storm events (as defined by TP-40 and/or subsequent revisions – see Table 3).
   - **b.** Runoff rates may be restricted to less than the historic rates when the capacity of the downstream conveyance system is limited.
   - **c.** To calculate stormwater runoff under historic conditions, the following historic curve number-values shall be used:

Hydrologic Soil Group	Curve Number
A	30
B	55
C	70
D	77

   - **d.** For rate control (goal) stormwater calculations the applicant shall use Figure 14 to determine the historic hydrologic soil group which will be matched with a historic curve number above. For those areas of the watershed (in Figure 14) classified as Urban - cut and fill land a geotechnical evaluation is required to characterize the present day soils which will be matched with a historic curve number above.

2. **Water Quality Goal**
   - **a.** The application area is the entire site (not just areas of the site being developed or disturbed). Stormwater best management practices should mimic, as close as feasibly possible, the site's historic water quality condition for the 95th percentile daily rainfall total (1.17 inches in 24hrs). Best management practices shall be selected on the basis of site-specific conditions, including soil types, depth to water table, and the presence of known or suspected contaminated soils.
   - **b.** To calculate stormwater runoff under historic conditions, the following historic CN-values will be used:

Hydrologic Soil Group	Curve Number
A	30
B	55
C	70
D	77

The MWMO encourages developers to use volume infiltration practices where site conditions are favorable. The MWMO prefers that sites with soils classified as Hydrologic Soil Group A or B meet the MWMO's water quality standard or goal through infiltration for at least that part of the site where Hydrologic Soil Group A or B soil is present. The corresponding ASTM Unified Soil Classification for Hydrologic Soil Group A and B soils is provided in Table B. If considering volume controls for a site see the Volume Control Guidance under 3.1.3.6 above.

3.1.5 Implementation of the MWMO's Standards

With respect to the financial impact of these standards, the MWMO does not foresee a significant increase in administrative, permitting, and enforcement costs for Local Units of Government adopting these standards. However, studies conducted by the MWMO do anticipate an increase in costs to public and private developers. Based on studies of public linear, residential, and commercial sites, developer costs are estimated to rise three to five percent with the adoption of the MWMO's Standards.

The MWMO is committed to ensuring the implementation of its standards in cooperation with member organizations. To promote consistency in application of the MWMO Standards, the MWMO recommends members adopt its ordinance-ready MWMO Standards language into their local ordinances. In addition, the

MWMO may provide training for local staff to ensure their familiarity with the standards. The MWMO may provide funding or staff to assist local inspection and enforcement efforts.

As required by statute, each member organization shall amend their local water management plans and adopt local controls that are consistent with the MWMO Standards in this Plan. An alternative compliance method to be approved by MWMO, either specific to these standards or consistent with the member organization's existing alternative compliance methods, can be part of the local controls. However, it is expected that alternative compliance methods would only be issued in the unique cases where specific and unique site conditions necessitate an alternative method to meet the goals of the MWMO Standards. It is expected that variances will be issued only in unique cases after all onsite and offsite alternative compliance options have been fully exhausted. The MWMO may allow a member community to comply with the rules and regulations of another watershed if the MWMO deems the standards of the other watershed management organization to be comparable to MWMO Standards set forth in this Plan. The MWMO Board of Commissioners reserves the right to review and comment on site alteration plans that affect the quality and quantity of water within and across its watershed and subwatershed boundaries.

To ensure ongoing improvement of the standards and their enforcement, the MWMO will convene annual meetings with member organizations and adjacent watersheds to review implementation of the standards and enforcement procedures (see Appendix I). Based on the results of these meetings the MWMO may revise the MWMO Standards and/or work with the cities to design more efficient and effective implementation and enforcement processes that ensure the protection of natural and water resources in the MWMO. A summary of this meeting will be provided in MWMO's annual report to BWSR.

If the MWMO determines that a member organization is not adequately carry out the implementation and enforcement of the (stormwater related) local controls enacted then, the MWMO will, at its discretion, assume partial or all permitting and enforcement responsibilities and hold the member organization accountable for costs associated with activities the organization failed to perform.

Evaluation of the effectiveness of MWMO's Standards and enforcement will be based in part on monitoring of the water resources and installed practices in the MWMO. The MWMO may also conduct periodic on-site reviews of permitted activities within member organizations' jurisdictions.

3.2 Local Water Management Plans: Adoption Timeline

Member organizations are responsible for preparing and adopting a local water management plan that is consistent with the MWMO Plan. The local water management plan must include information on land use, stormwater runoff, stormwater storage, water quality, and implementation methods to protect local resources. The specific content requirements of local water management plans are found in this section and defined in Minnesota Statue 103B.235 and Minnesota Rule 8410.0160 and 8410.0170 and revisions to these (see Appendix D and G).

During the interim period between MWMO Plan adoption and local government adoption of local/official controls (IE: ordinances), the MWMO may work with local governments to revise and adopt their controls to incorporate the MWMO Standards. As the ordinance comparison table contained in Appendix H illustrates, member communities already have rule language similar to that proposed by the MWMO. Within this interim period, member communities can receive assistance in reviewing and ensuring compliance with MWMO Standards.

The local water management plans must be consistent with all of the Watershed Management Plans that fall within the municipal boundary. Each local water management plan must be approved by the MWMO and adopted by the Local Government Unit within 2 years of this plan's final approval by Board of Water and Soil Resources. The MWMO will notify each member organization of the requirement to revise or prepare local water management plans that conform to this Plan following approval by Board of Water and Soil Resources of the Watershed Management Plan.

The deadline for Member organizations to adopt of local water management plans is May 2013. Additionally, local/official controls (IE: ordinances) need to be updated to reflect the standards of the plan within 2 years and 3 months of this plan's final adoption by the MWMO. Implementation and enforcement of these local/official controls needs to start within 2 years and 6 months of this plan's final adoption by the MWMO. The MWMO's future volume standard will need to be adopted and implemented within 3 years of this plan's final adoption by the MWMO. To achieve this deadline, member cities will likely need to carryout Local Water Management Plan updates concurrently with their process to develop, adopt and implement the local controls, see Appendix R for a Minneapolis examples. The Minnesota Department of Transportation will also need to be operating in compliance with the MWMO's Standards within 2 years and 6 months of this plan's final adoption by the MWMO. The MWMO's future volume standard will need to be adopted and implemented within 3 years of this plan's final adoption by the MWMO.

Table 3: Local Water Management Plan Amendment review and approval timeline; Adoption of Local Water Management Plan revisions into local/official controls; Implementation of adopted local/official controls

2011 - May	MWMO Plan Approved by BWSR and Adopted by MWMO
2012 - October	Deadline for Submittal of Local Water Management Plans to MWMO, County, and Metropolitan Council
2012 - December	MWMO Receives Comments on Local Water Management Plans from County and Metropolitan Council
2012 - December	MWMO Provides Comments on Local Water Management Plans
2013 - January	MWMO Approves or Denies Local Water Management Plans or Member Organizations Agree to Extension
2013 - February	Deadline for Local Water Management Plan Approval by MWMO
2013 - May	Deadline for Member Organizations to Adopt Local Water Management Plans
2013 - August	Member Organizations Adopt Local/Official Controls
2013 - November	Member Organizations Start to Implement and Enforce Local/Official Controls
2014 – May	Member Organizations Start to Implement and Enforce Local/Official Controls related to volume.

A tracking, review and assistance process will follow the approval and adoption of the MWMO's Watershed Management Plan. During the first two and a half years the MWMO will work with the cities to adopt the MWMO's Standards into their Local Water Management Plans and local/official controls, and ultimately to implement and enforce these local/official controls.

The MWMO will assemble a technical advisory group from our member organizations and others to review the costs to implement, enforce, and construct to the MWMO Standards. The MWMO will evaluate if stormwater management costs per site are in line with the initial estimates used to set the standards. Cities and developers will be asked to provide project cost details for this analysis. See Appendix I for a list of materials to be submitted.

Given the findings of this review, the MWMO and its members will assess whether the MWMO's Standards are being carried out and ultimately result in an annual decision to maintain or modify the existing process for achieving the goals of the MWMO and its members.

Over time the MWMO will determine the effectiveness of stormwater management efforts in the Watershed by correlating the intended impacts of best management practices installed in a given subwatershed with changes in pollutant concentrations found in that subwatershed. In this manner, monitoring data on end of the pipe concentrations discharging to the river will be used to adjust management efforts over the long term. The MWMO will also collect in-stream Mississippi River data and review the long term cumulative impact occurring from all pipes discharging into the Mississippi River within the MWMO. Ultimately these findings will guide decisions on whether the MWMO's Standards are sufficient to achieve the goals of the MWMO and its members.

If the MWMO determines that a member organization is not taking the necessary steps to complete, within the timeframe provided in Table 3, one or more of the following actions:

1. Amended its local water management plan
2. Followed through with adoption to local controls
3. Carried out enforcement/implementation of local controls enacted

Then the MWMO will, at its discretion, assume partial or all permitting and enforcement responsibilities and hold the member organization accountable for costs associated with activities the organization failed to perform.

3.3 Local Water Management Plans: General Review Procedure (for reviews not associated with a MWMO 10-year plan update)

The MWMO is required to review and approve local water management plans and amendments that impact water and natural resources. Local water management plans must be submitted to the MWMO with adequate time to complete the review process prior to the required deadline for local water management plan adoption (MN Rules 8410.0160, see also Appendix G). It is expected that local water management plans will undergo a full update at least once every 10 years. The review and approval process for local water management plan amendments and updates is the same as the process for the original approval of the local water management plan amendments. The updated plan should be submitted for review to MWMO, County, and Metropolitan Council. The County and Metropolitan Council have 45 days to review and provide comment on the updated plan. The MWMO has 60 days to provide comment on the updated plan and approve or disapprove the plan. The review by Metropolitan Council, County, and MWMO run concurrently.

After the MWMO has responded to the initial submittal of the draft plan, additional review is conducted cooperatively and is not governed by a formal review process timeline. However, once a plan is received by MWMO, the MWMO will respond within 60 days with the Board's action of approved or denied or will request an extension of the review period from the member organization. If the member organization has not agreed to an extension and the MWMO has not acted on the plan within 60 days, the plan is deemed approved [103B.235 sub 3]. The MWMO expects to request a maximum total review extension of 120 days.

3.4 Local Water Management Plans: Content Requirements

Minnesota Statutes, section 103B.235 and Minnesota Rule 8410, discuss the particular requirements and format of a local water management plan (see areas in Appendix D and G). The MWMO is especially interested in problems identified in the local water management plan and corrective actions that affect the MWMO concerns stated in this Plan or that require MWMO collaboration.

Member organizations may adopt by reference all, or part, of this MWMO Plan. If a member organization does not adopt the MWMO Plan, their local water management plan will need to meet the requirements outlined in Minnesota Statutes, section 103B.235 and Minnesota Rule 8410.0170, as well as the content in Table 4 below. If a member organization partially adopts the MWMO Plan then any requirements in the MWMO Plan not adopted will need to be completed and included in their local water management plan, along with the content described in Table 4. Member organizations that adopt by reference all of the MWMO Plan into their local water management plan also need to complete and include content elements found in Table 4 in their local water management plan.

Table 4: Local plan content requirements

Water, Natural Resources, and Land Use Goals and Policies

- Include goals and policies to address those problems identified in the MWMO Plan that affect the community (see Appendix O and Focus Statements in Table 20).
- Include current and future land use maps and a description of the impervious surface cover expected for the allowed uses.
- Include wetlands, natural resources, and land conservation areas identified by the municipality.
- Identify land use controls necessary to provide protection or improvement of water and natural resources.
- Summarize all Total Maximum Daily Load (TMDL) compliance requirements for the city.
- Summarize all current activities completed to date to comply with (TMDL) requirements.

Infrastructure Assessments and Programs

- Include a stormwater storage and conveyance map identifying location, size, and remaining capacity of stormwater management features including stormwater storage, water quality treatment, infiltration, and conveyance infrastructure. Include stormwater best management on all public and private properties that have been reviewed, approved, or funded by the city.
- Identify changes in capacity of stormwater management features needed to address storage, infiltration, water quality treatment, and conveyance under current and future land use.
- Identify programmatic, non-structural or structural solutions to address the identified problems.
- Include a map identifying locations of planned or potential regional or local stormwater management facilities.
- Identify any implementation programs, maintenance activities, or capital improvement programs where MWMO funding or assistance is desired.
- Provide a schedule and annual process for assessing the need for water resource-related capital improvement programs or projects in the city.
- Provide a summary of the member organizations' Storm Water Pollution Prevention Program and conformance with the requirements of the Environmental Protection Agency's National Pollutant Discharge Elimination System (NPDES) for municipal separate storm sewer systems (MS4s) or summarize relevant plans and programs of the member organization that address:
    - Inspection and maintenance plans (wet ponds, infiltration basins, raingardens, stormsewer systems, etc.)
    - Street sweeping, right-of-way maintenance, road icing, salt storage, snow plowing and snow storage programs
    - Spill response and containment plans

MWMO Standards

- Identify how the member organization intends to implement and enforce each standard established in the MWMO's Watershed Management Plan.
- Outline the member organizations' permitting and/or site review processes for MWMO Standards.
- Include draft ordinances that are at least as restrictive as MWMO Standards.

Surface Water Appropriations

- Identify city permitting fees and requirements for surface water appropriations that draw less than 10,000 gallons per day or 1 million gallons per year.(See MS 103B.211, subdivision 4, and MS 103G.271, subdivision 4).

Evaluation

- Identify how improvement is shown through implementation of the local water management plan

The member organizations should determine if other management programs are necessary to meet their local water management plan goals, and the goals of this Plan.

The MWMO will discuss with each member organization the options that address its circumstances and will collaboratively determine the most practical approach to meeting the requirements of this Plan and Minnesota Rules Chapter 8410. The MWMO understands the need to be sensitive to consistency with adjacent watershed districts and water management organizations. Coordination is required to successfully implement watershed standards and projects and maintain the integrity of the MWMO's goals. The MWMO will work closely with cities as needed in local water management plan preparation, review, and implementation. The MWMO will apply its goals, objectives, and policies to its review of local water management plans.

3.5 General Compliance Requirements

1. Make Local Water Management Plans available at city offices and provide the MWMO an office reference copy.

2. The MWMO requires member cities to have a Department of Natural Resources approved Floodplain Ordinance and a Department of Natural Resources approved Shoreline Ordinance. If no ordinance is applicable, the MWMO requires that there be no encroachment on floodways that results in reduced capacities or expedited flood flows. The only structures allowed in the flood zone are those that have been floodproofed and approved by the Department of Natural Resources.

3. Member cities are required to comply with Total Maximum Daily Load (TMDL) requirements as required by their respective MS4 permits.

4. Member cities are required to address the following stormwater management and stormwater maintenance standards in a manner consistent with MWMO Standards, applicable Total Maximum Daily Loads (TMDL) and National Pollutant Discharge Elimination System (NPDES) standards for municipal separate storm sewer systems (MS4s):
   - Target pollutant loads
   - Maximum allowable runoff rates(MWMO standard)
   - Design criteria for stormwater structures addressing floatable materials and maintenance
   - Design criteria for stormwater facilities to address target pollutant loads
   - Schedule for street sweeping, stormwater facility inspection, and maintenance
   - Spill containment and clean-up plan

5. Member cities are required to develop, implement and enforce a permitting program for surface water appropriations that draw less than 10,000 gallons per day or 1 million gallons per year.(See MS 103B.211, subdivision 4. and MS 103G.271, subdivision 4.). Cities should request an associated permit fee amount to be established by the MWMO.

3.6 MWMO and All Water-Related Authorities

The MWMO is formed under a Joint Powers Agreement in accordance with the Minnesota Statute Section 103B. Joint Powers Agreements may have a narrowing or broadening effect on the authorities allotted to Watershed Management Organizations by Minnesota Statute Section 103B. Authorities held in common by all member cities may be transferred to the Watershed Management Organization, with the exception of revenue-related authorities. However, the MWMO's current Joint Powers (Cooperative) Agreement does not narrow or expand the authorities allotted by Minnesota Statute Section 103B.

The Water Resource-Related Activities of MWMO Member Organizations table (Appendix J) identifies the water resource-related activities of each member organization and the MWMO. The Wetland Conservation Act authority held in common by the cities is an example of an authority that could be wholly or partially transferred to the MWMO. This table should also be utilized for identifying partnership opportunities that generate synergies and efficiencies in managing water resources in the Watershed.

Appendix J Table Layout and Content Guidance
The table is organized by the "regulated water feature" (e.g. wetland, surface waters, navigable waters, and so on). These water categories were chosen because they often have a spatial dimension and they reflect common areas for water resource laws and regulations. Within each water category there are related subtopic areas. See Appendix J for definitions on each subtopic area.

In the table, the MWMO and member organizations are shown as having either "Authority" or "Responsibility" activity types related to each water subtopic. The following definitions define the meaning of these terms for use in Table 5 (included as Appendix J):

Authority - authority refers to a claim of legitimacy, the justification and right to exercise police powers. Police power is the capacity of a government authority to regulate behaviors and enforce order within its territory, often framed in terms of public welfare, security, health, and safety. Regulations pertaining to the environment and aesthetics have been ruled by courts to be within the police powers of government. The exercise of police power can be in the form of making laws, and compelling obedience to those laws through physical means with the aim of removing liberty, introducing legal sanctions, or other forms of coercion and inducements. In this project, activities defined as "authority" most often include permitting, ordinance development, enforcement, and approval of a plan, project, or program by some other entity. It also includes ability to elevate a particular strategy or issue to a higher authority or additional level of review.

Responsibility – responsibility includes a variety of activities that government is required, either by law or by choice, to conduct. This may include planning activities that set strategy and program direction; capital improvement programs; informational programs such as monitoring, data gathering, and reporting; and reviewing and commenting on others' plans and programs. Responsibility may also include grants and other incentive programs to encourage behavior.

The Water Resource-Related Activities of MWMO Member Organizations Table 5 in Appendix J is a subset of information from a more extensive study the MWMO has completed identifying all of the entities with water-related jurisdictional authorities and responsibilities operating within the MWMO. Contact the MWMO to request a copy of this study.

3.7 Accessing MWMO Funding
This Plan establishes a number of programmatic areas designed in part to complement local projects and program efforts with MWMO funds. Local projects and programs need to align with MWMO goals in order to qualify for Member Grant and Land Conservation programmatic funding. Member organizations and others seeking funding will need to seek out and propose projects that primarily improve water resources.

All Member Grant, Greening and capital projects funded will need to meet the MWMO's Standards and submit a diagnostic and feasibility study with the funding request. Once adopted by member cities (the standards) or permitted by the MWMO, only the cost of the portions of the project that exceed MWMO's Standards may be funded. In limited cases the MWMO may, however, consider funding projects that do not fully meet the MWMO Standards if the project is highly effective or innovative. (See Table 6 below for a list of all funding details and see 3.1.3 The MWMO's Standards Language and Appendix F). The MWMO is particularly interested in funding demonstrations of new technologies, practices, and programs relating to improving the health of water resources.

To streamline the Member Grant funding process, members' implementation schedules for water resource-related Capital Improvement Projects should align with the MWMO's Member Grant process. Member Organizations and other governmental entities seeking Member Grant funding are encouraged to involve MWMO staff early in the project's schematic design process (Appendices T and R). Potential grantees need to provide a one-year funding request notice, from spring to spring. For example, funding requests received in the spring of 2010 will be considered for the 2012 budget cycle. Member Grant projects in this Plan will feed into programmatic and individual annual work plans and funding reviews.

Table 6: MWMO funding details

1. Member Grant, Greening and Land Conservation projects must meet the following project selection criteria:
   - Projects selected must meet the objectives found within the program's description (see 7.0 MWMO Administration/Internal Operations section of this plan)
   - Projects selected must result in a direct connection to cleaner water, an environmentally literate public, and a healthier ecosystem
   - Projects selected must provide measurable outcomes for the Watershed's natural resources
   - Projects selected must meet or exceed MWMO Standards*
   - Projects must support current subwatershed management goals
   - Projects selected must meet MWMO design guidelines

2. The MWMO limits its funding of water recreational facilities to those projects that bring water resources and related terrestrial and aquatic habitat closer to achieving a fishable and swimmable condition.
3. Any requested investments in property will need to demonstrate how the amount requested is proportional to achieving MWMO goals for conservation, preservation, and improvement of water quality, water quantity, wetlands, and habitats.

4. Member Grant project funding for water resource-related elements:
   a. Prior to the cities adopting the MWMO's standards, all projects receiving MWMO funds will need to meet the MWMO Standards and design guidelines. The MWMO may pay for the incremental increase in cost of water-related elements between the existing regulations and MWMO's Standards.
   b. 2 years and 6 months after the approval of this plan, or sooner, projects receiving MWMO funds will need to meet the MWMO standards and design guidelines. The MWMO may pay for the cost of water-related elements above and beyond the MWMO's standards.

* In limited cases the MWMO may consider funding projects that do not fully meet the MWMO standards if the project is highly innovative or successful in producing a desired or intended result in regards to cost and stormwater treatment needs in the Watershed.

The most recent version of the following Capital Improvement Programs/Projects (CIPs) or similar documents will be used to guide future Member Grant requests.

- Minneapolis Capital Improvement Projects, Mayor's Proposed 2009 – 2013 Capital Plan (web-based, Map Date: October 21, 2008)
- Lauderdale Draft Capital Improvement Plan 2008 to 2017 (July 14, 2008)
- Hennepin County 2009-2013 Transportation CIP (web-based, version 1.16, December 16, 2008)
- US Army Corps of Engineers (USACOE) Projects, Studies, and Managed Facilities Finder (web-based, List Date: March 18, 2009)
- Ramsey County Groundwater Protection Plan (2009)
- The City of St Anthony Village's Comprehensive Plan (2008)
- Minneapolis Park and Recreation Board Comprehensive Plan (2007)

In addition to the CIPs received, we were also made aware of a variety of small area or neighborhood-scale plans. Figure 2 shows a location map for the special area plans provided. The following plans are shown on Figure 2:

ID#	Plan Name	Year
▪ 1	Bryn - Mawr Neighborhood Land Use Plan	2005
▪ 2	Elliot Park Neighborhood Master Plan	2003
▪ 3	Master Plan for the Marcey Holmes Neighborhood & Supplement	2007
▪ 4	Corcoran Midtown Revival Plan	2002
▪ 5	Above the Falls - A Master Plan for the Upper River in Minneapolis	2000
▪ 6	Near Northside Master Plan	2000
▪ 7	Uptown Small Area Plan	2008
▪ 8	Northside Jobs Park Design Guidelines	1997
▪ 9	Cedar Riverside Small Area Plan	2008
▪ 10	Southeast Minneapolis Industrial (SEMI) / Bridal Veil Refined Master Plan	2001
▪ 11	Steward and Longfellow Greenway Area Land Use and Predevelopment Study	2007
▪ 12	38th Street and Chicago Avenue Small Area/Corridor Framework Plan	2008
▪ 13	Downtown East/North Loop Master Plan	2003
▪ 14	Audubon Park Neighborhood Master Plan	2008
▪ 15	Lowry Avenue Corridor Plan	2002
▪ 16	West Broadway Alive	2008
▪ 17	Development Objectives for North Nicollet Mall	2000
▪ 18	Central Avenue Small Area Plan	2008
▪ 19	University Avenue SE & 29th Ave SE Development Objectives and Design Guidelines	2007
▪ 20	Midtown Minneapolis Land Use Development Plan	2005
▪ 21	Lyndale Avenue: A Vision	2007
▪ 22	Nicollet Avenue: The Revitalization of Minneapolis Main Street	2000
▪ 23	Midtown Greenway Land Use and Development Plan	2007
▪ 24	Historic Mills District Master Plan and Update	2001
▪ 25	Grain Belt Development Objective	1996
▪ 26	Hi-Lake Shopping Center Development Guidelines and Objectives	2001
▪ 27	Hiawatha/Lake Station Area Master Plan	2001
▪ 28	46th Street Station Area Master Plan	2001
▪ 29	38th Street Station Area Plan	2006
▪ 30	Franklin-Cedar/Riverside Area Master Plan	2001

3.8 Financial Impact of this Plan on Member Organizations

This plan lays out requirements for local water management plans, sets standards to be implemented by the member organizations, and outlines MMWO partnership and funding opportunities for member organization. The plan does not outline specific capital improvements or other projects for member organizations. Costs to member organizations associated with the implementation of the requirements of this plan will include the development or revision of local water management plans, the development or revision of ordinances to address MWMO standards, the implementation of standards in member organization projects, and the completion of project reviews based on adopted standards. The MWMO's Member Grant funding program will assist the member organizations in paying for capital improvement projects that meet the goals and standards of the MWMO. MWMO also provides funding through other programs to assist with planning, monitoring, science, education, and assessment activities.

Figure 2: Location map for the special area plans

MEMORANDUM

TO: Lisa Cerney, PE – City of Minneapolis
Bruce Irish, PE – Minnesota Department of Transportation
Doug Snyder – Mississippi Watershed Management Organization

FROM: Justin Klabo, PE – SEH, Water Resources Engineer
Anne Haws, EIT – SEH, Water Resources Engineer

DATE: August 5, 2013

RE: I-35W Corridor Drainage Study
Storm Water Regulations
SEH No. HENNC 113114

I. Study Overview

The I-35W Corridor Drainage Study proposes to analyze the I-35W corridor from I-94 to approximately E. 42nd Street. The I-35W Corridor Drainage Study is broken down into three study areas.

- 94 Commons Area – Including the work proposed on I-94, from I-94 to approximately E. 26th Street.
- Transit/Access Area – Approximately E. 26th Street to E. 33rd Street.
- Gap Area – Approximately E. 33rd Street to E. 42nd Street.

The purpose of this memorandum is to summarize the storm water regulations that apply to the I-35W corridor. These requirements will be used as the foundation of the storm water design for all three study areas. The memorandum identifies the governmental agencies that have storm water management jurisdiction on the project and their respective storm water standards. The standards for each of the storm water design criteria have been identified and are listed in this memorandum to establish the design standards that apply to the drainage study.

II. Governing Agencies and Policies

All three study areas are under the jurisdiction of the same three governing organizations; (1) Mississippi Watershed Management Organization (MWMO), (2) the Minnesota Pollution Control Agency (MPCA) General Permit and (3) the City of Minneapolis (City). Each organization has its own specific storm water design goals and standards. The City and the MPCA require storm water management permits to be obtained for individual projects. The MWMO is not a permitting agency, and therefore relies on its member communities to address and regulate their policies and goals.

Mississippi WMO

The MWMO does not issue permits or provide approval letters for construction projects. Instead, it relies on the existing permitting and enforcement bodies of its member communities. The MWMO Board reserves the right to

review and comment on plans that affect the quality and quantity of water within and across its watershed and subwatershed boundaries. Any project creating greater than one acre of land disturbance is subject to the MWMO standards. The three main storm water control criteria are rate control, water quality, and volume control. The MWMO Watershed Management Plan for Maintenance, Drainage Alterations, Bounce and Duration Control, Flood Control, Erosion and Sediment Control and Incentivized Standards has been attached for additional details on the standards. A summary of the three main storm water control standards is provided below.

Rate Control- Runoff rates for the proposed activity shall not exceed pre-development runoff rates for the Type II distribution 2-, 10-, and 100-year critical storm events (as defined by TP- 40 and/or subsequent revisions, including Atlas 14). Pre-development is defined as existing site conditions.

Water Quality- Projects shall achieve a removal of 90% TSS (Total Suspended Solids) from the 95th percentile daily rainfall total, currently 1.17 inches over 24 hours over the entire site area, not just the areas of the site being developed or disturbed. The 95th percentile daily rainfall total will be updated based on the Atlas 14 data per conversations with the WMO.

Volume Control- The use of infiltration is recommended, but not required.

The MWMO has exclusive conditions pertaining to MnDOT projects. As a result of the limited right of way and land available along MnDOT roadways, MWMO allows MnDOT to construct permanent storm water management features outside of the immediate project area to mitigate for the impacts of the project. The complete language for these exclusive conditions by the MWMO can be found on Page 19, Section 3.1.3.5.d of the Watershed Management Plan (2011-2021). Provided below is a brief summary of the sequencing required prior to mitigating the storm water treatment at an offsite location.

- The project must analyze the existing site to determine if onsite treatment of storm water is possible.
- If onsite treatment is not possible then the project can pursue providing treatment at an offsite location within the watershed.
- If treatment within the watershed is not possible, then the project can pursue treatment locations outside of the MWMO boundary.
    - Prior to MWMO approving project treatment sites outside of the watershed, MnDOT must provide a feasibility study or demonstrate a site's limiting conditions that prevent complying with the MWMO standard onsite.
    - For projects outside of the watershed, the MWMO's remaining treatment will be in addition to any local site volume, rate and water quality requirements.

Minnesota Pollution Control Agency

The MPCA regulates stormwater discharges associated with construction activity throughout Minnesota. The MPCA has re-issued the General Permit (Permit) effective August 1, 2013. The Permit is available to the public and the study area will be designed based on the re-issued permit design standards. The permit is required for all construction activity that disturbs one or more acre of soil. Projects that ultimately create a new impervious surface area greater than 1.0 acres are required to provide permanent storm water management. The re-issued Permit has been attached as a reference. A summary of the specific Permit requirements for the main storm water controls are detailed below.

Rate Control – The MPCA does not require an all encompassing, project-wide, rate control requirement. However, discharge rates are regulated based on specific type of BMP used. Specifically, wet sedimentation

basins must be designed such that the outlets water quality volume is not discharged at greater than 5.66 cfs per acre of surface area of the pond.

Water Quality – Where a project's ultimate development replaces vegetation and/or pervious surfaces with one or more acres of new cumulative impervious surface, the water quality volume of one inch of runoff from the new impervious surfaces created on the project needs to be retained on site.

In cases where infiltration is prohibited, including but not limited to: close proximity to bedrock, poorly draining soils, or contaminated soils; the permittee shall consider other methods of volume reduction. In this case, the water quality volume must be treated by a wet sedimentation basin, filtration system, regional ponding or equivalent methods prior to discharge of stormwater to surface waters. The water quality goal of one inch over new impervious may be met using these equivalent methods; see the attached Construction Permit, for information specific to each BMP.

Volume Control – See Water Quality section above.

City of Minneapolis

The City of Minneapolis requires Storm Water Management plans to be submitted and reviewed on all construction projects greater than one acre in size. These plans must follow the Minneapolis Code of Ordinance, Chapter 54. The Storm Water Management Standards are summarized below and can be found within the ordinance in section 54.70, Part 3.

Rate Control – Development should be planned in a manner that does not increase peak flows for the 2-, 10-, and 100-year 24 hour storm events. The rate control standard is measured relative to existing site conditions.

Water Quality – The City of Minneapolis requires specific water quality standards based on the project's individual receiving water. At a minimum, all receiving waters within the City shall remove 70% of the total suspended solids (TSS) from the net new impervious surface area. The I-35W corridor's receiving water body is the Mississippi River. This receiving water has no further water quality requirements.

Volume Control – The use of infiltration is recommended, but not required. To the greatest degree (except in the case of storm water hotspots), natural drainage ways and vegetated soil surfaces should be used to convey, store, filter, and retain storm water before discharging runoff into public waters or the public drain system.

Minnesota Department of Transportation (MnDOT)

The study is located in an area of the I-35W roadway corridor that is prone to surface flooding as a result of limited capacity of the downstream storm sewer system. Based on this known flooding issue, the study area is required to meet specific requirements as set forth by the MnDOT District Engineer. The study area is required to maintain or reduce the depth of flooding occurring throughout the project corridor and to not exacerbate the existing flooding conditions.

III. Corridor Storm Water Design Standards

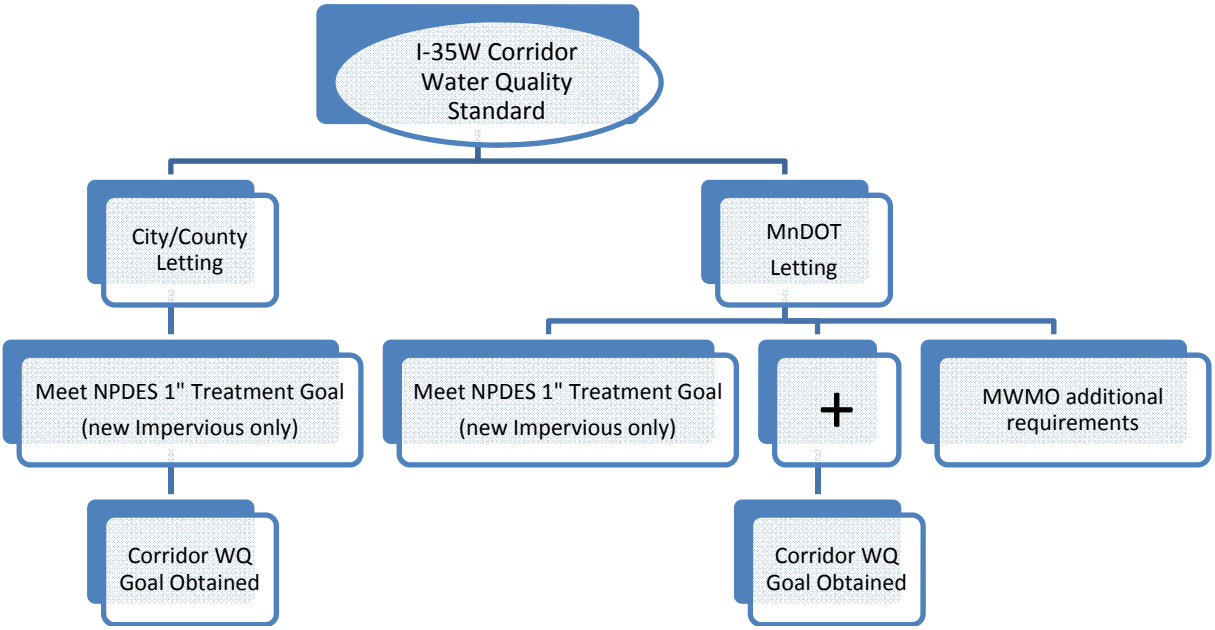
The storm water design standards for the corridor are based on who will be letting the project. Either the City/County could let the project or MnDOT. At this time it is anticipated that MnDOT will let the project therefore the standards listed below are based on a MnDOT letting. It is MnDOT's policy to meet the NPDES and the local WMO standards. MnDOT does not obtain permits from local Cities therefore they do not design projects to meet City standards.

The only storm water management standard that will vary based on which agency lets the project is the water quality standard. The rate control and volume control standards are the same goal regardless of the letting agency.

Rate Control – Discharge rates for the study area shall not exceed pre-development runoff rates for the Type II distribution 2-, 10-, and 100-year critical storm events as defined by the Atlas 14 rainfall distribution.

Water Quality – Based on the MWMO goals, the project shall achieve a removal of 90% TSS (Total Suspended Solids) from the 95th percentile daily rainfall total (currently 1.17 inches in 24hrs) over the entire area of the site, not just areas of the site being developed or disturbed.

Based on the re-issued NPDES Permit, the City's water quality goal is less stringent than the NPDES standard therefore the baseline water quality treatment for the project regardless of who will be letting the project is the NPDES standard. The flow chart below details the two paths that could be taken based on the different letting scenarios.



Based on the MnDOT letting scenario, the project would meet the NPDES standards for the net new impervious surface area. Then to meet the MWMO goal for the entire site, the treatment provided to meet the NPDES standards would be subtracted from the MWMO goal to determine the remaining treatment needed to be provided for the stud area.

Volume Control – The study area will need to retain onsite a water quality volume equal to one inch of rainfall over the net new impervious surface area based on the re-issued NPDES Permit.
Drainage Roadway Design Criteria – The drainage design for the roadway corridor will be based on the updated rainfall depths in Altas 14.

- Sag Points – The project shall not increase the depth of ponding occurring at existing sag points. Ultimately the project shall reduce or maintain the depth of flooding occurring at these locations.
- Storm Sewer and Catch Basin Design – Shall be in accordance with the Drainage Manual and Technical Memorandum issued by MnDOT

IV. Project Approach

The I-35W Corridor Drainage Study will proceed based on the standards as noted above. The study will move forward based on meeting the water quality standard of the MWMO. If there is any change to who will be letting the project, the water quality goal will be adjusted at that time.

Ultimately, a preliminary drainage report will be generated documenting the standards, treatment methods and supporting documentation. The preliminary drainage report will be provided for review and comment by governing agencies.

The project will demonstrate compliance to the storm water regulations as follows:

Rate Control and Flood Control – The existing XPSWMM model will be utilized to analyze the storm sewer system and establish the base line flow rates and depth of ponding for the existing conditions. These flow rates and depths of ponding will set the base line conditions for the corridor. The proposed storm water improvements will be compared against these values to ensure the corridor is meeting the agency requirements as noted above.

Water Quality – The study will analyze the proposed storm water features to determine the pollutant load removal for each feature using P8. The goal of the corridor will be calculated based on a load reduction goal, expressed in terms of pounds/year of Total Suspended Solids (TSS). As a result of the linear corridor, not all areas will be able to be captured and routed to treatment devices based on the configuration of the existing system. Therefore, it is anticipated that areas outside the I-35W corridor may be treated to offset areas that go untreated within the corridor.

Volume Control – The required volume control for the corridor will be quantified based on the volume of the infiltration feature and the infiltration capacity of the soil based on the Minnesota Stormwater Manual recommended infiltration rates in areas where infiltration is a feasible option.

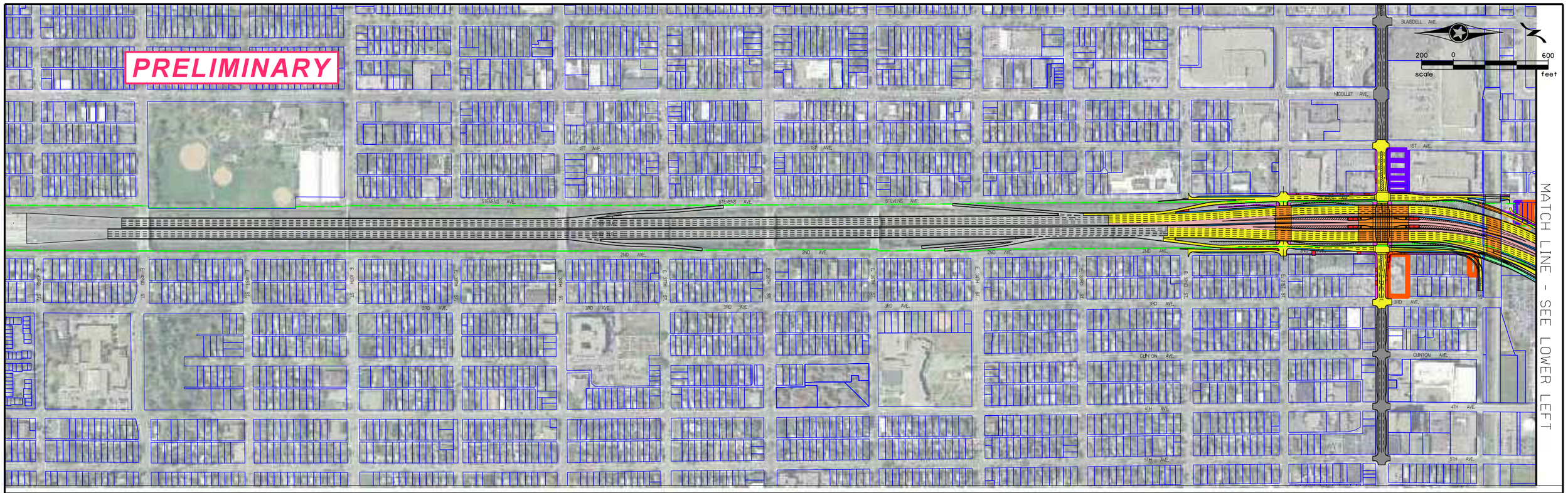
Attachments
- Preliminary Project Layout
- City of Minneapolis Ordinance Chapter 54
- MWMO Watershed Management Plan – Section 3
- Re-issued MPCA General Permit

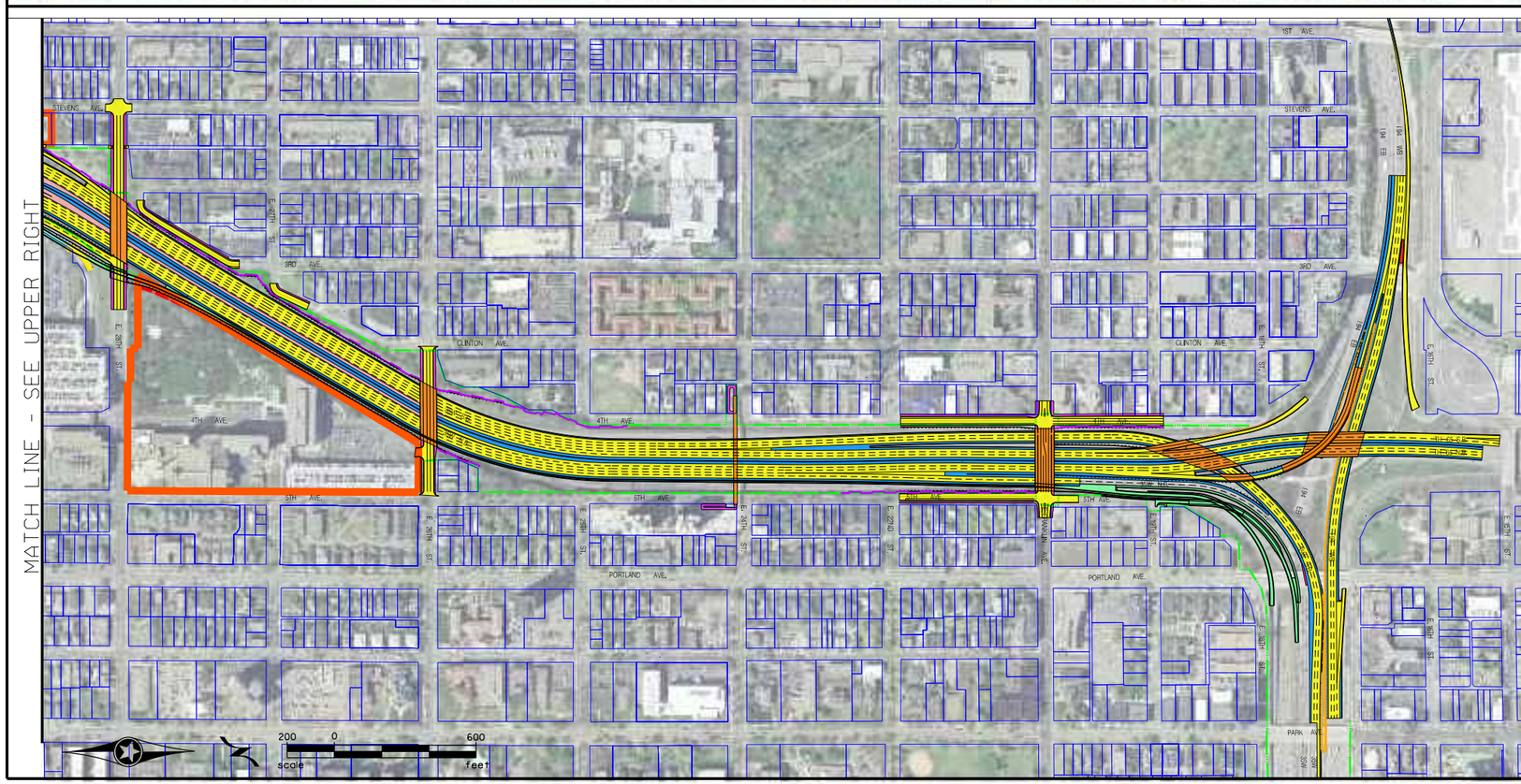
c: Jim Grube | Hennepin County
Jenifer Hager | City of Minneapolis

Kelly Moriarity | City of Minneapolis
Beth Neuendorf | MnDOT
Scott Carlstom | MnDOT
Mark Dierling | SEH
Ron Leaf | SEH
Lindsey Roberts McKenzie | SEH

s:\fj\h\hennc\113114\5-dsgn\50-waterresources\memos\113114_agencymemo_stormwaterregs_final.docx

This Page Left Blank Intentionally





LEGEND

- Proposed Roadways
- Proposed Bridges, Walls
- Proposed Shoulder
- Proposed Raised Median, Curb
- Proposed Median Barrier
- Proposed Walks, Trails
- Proposed Managed Lanes
- Proposed Future Construction
- Proposed Braid Bridge Construction
- Proposed Retaining Wall
- Proposed Noise Wall
- Proposed Guardrail
- Parcel Boundary
- Existing ROW

PRELIMINARY

I-35W COMPLETE PROJECT

I-35W Transit/Access PROJECT

DATE: 6/3/2013

FIGURE

2:03:38 PM 6/3/2013 shotchkin

S:\FJ\X\Henne\113114\5-dsgn\51-cadd\DGN figures\WRE 6-3-13 figure.dgn
full build-over under

This Page Left Blank Intentionally

3.0 Member Authorities and Responsibilities

The MWMO will work with member organizations and other water-related authorities to implement the goals and strategies of this Plan. Coordination between the MWMO and member organizations requires that each organization has a clear role. This section of the Plan clarifies these roles by describing the MWMO's expectations of each authority in the areas of MWMO's Standards, members' Local Water Management Plans, all water-related authorities in the MWMO, and MWMO Funding.

3.1 Adopting MWMO's Standards

The MWMO recognizes that the control and determination of appropriate land uses is the responsibility of the Local Units of Government. Since the MWMO is responsible for the protection and management of surface and groundwater systems, it is well equipped to develop resource-based standards (MWMO Standards) that will best address the impact of the surrounding land use on the quality of these resources. The MWMO does not issue permits or provide approval letters for construction projects; rather, it relies on the existing permitting and enforcement bodies of its member organizations. To continue this efficiency in government, the MWMO prefers to have member organizations integrate the implementation and enforcement of MWMO Standards into their existing regulatory departments (see Appendix F). The MWMO is ready to assist its member organizations by providing additional staff expertise and funding for the writing of these standards into ordinance. The following standards have been written with the acknowledgement that more details may need to be added as the city ordinances are written.

3.1.1 Volume Control in Urban Areas

It is clear, given the recent, discussions with our member organizations and the Minnesota Department of Transportation, that the MWMO's highly urban setting and non-native soils creates concerns over the viability of volume controls for stormwater management. Our members have stated there are few, if any, parcels suitable for infiltration in the MWMO and that volume control best practices are not cost effective and efficient. As such, requiring developers to design for a volume standard would result in infeasible or cost prohibitive public and private projects. In addition, there are currently a number of significant studies underway to in the Twin Cities Metropolitan Area and in other parts of the country to better define the reasonableness of a volume standard in highly urbanized settings.

The MWMO acknowledges these are concerns that need to be addressed as we continue to move forward toward a volume standard. The MWMO believes a volume standard is necessary to maintain the health of the water resources, meet the loading reductions required, and to maintain the longevity of the pipeshed system. Volume control is beneficial for many reasons. Volume practices have the highest efficiency in removal of pollutants and the remove the greatest numbers pollutants. Volume controls prevent attenuate peak flows, i.e. increased periods of discharge, within the pipeshed, which maintains the existing pipeshed capacity and may reduce longterm maintenance costs on the pipeshed system.

Given the discussions and the addition studies underway, the MWMO has agreed to: delay the implementation of a volume control standard within the Watershed; conduct additional studies to determine how urban redevelopment conditions found in the MWMO will affect the viability and potential form of the volume control standard; and wait for further results from two current studies underway before finalizing a volume standard. The first study is the Minnesota Pollution Control Agency's Minimal Impact Development Study, a comparison of new development volume standards; and the second is the Environmental Protection Agency's consideration of volume treatment requirements and whether volume, in and of itself, should be considered a pollutant.

The MWMO will complete the following studies and reviews: the MWMO will partner with member communities to identify opportunity areas for regional and site level abstraction throughout the watershed; the MWMO will review Tom Schueler's Technical Bulletin No. 5. Stormwater Design for High Intensity Redevelopment Projects; the MWMO will analyze the effectiveness and cost associated with stormwater volume control via techniques that amend soils and disconnecting impervious surfaces; the MWMO will research new

stormwater best management practices and related operations and maintenance issues; and the MWMO will conduct a feasibility study that will propose a volume incentive and a single water quality standard.

During the interim period (1 to 2.5 years) MWMO members and the Minnesota Department of Transportation have commitment to meet and discuss aspects of a future volume standard appropriate for the MWMO's urban watershed setting. Furthermore, once a standard is adopted by the MWMO, members and the Minnesota Department of Transportation have agreed to update their local controls or project design standards to comply with the MWMO's standard. The revisions and a local adoption shall be completed within a period of 180 days from the approved changes to the MWMO's Plan. The MWMO's volume standard will be adopted and implemented within 3 years of the MWMO's Third Generation Plan's final approval.

3.1.2 Limiting Costs of Stormwater Treatment

Initially, stormwater best management practices were designed to meet conditions found in new growth areas, outside of urban core, where there were few limiting conditions to site development. However, in highly urbanized areas, where property may have had multiple land uses and been redeveloped many times there is a great likelihood there will be factors that limit certain types of best management practices to manage stormwater. Thus, when the same best management practices are fitted to the urban core the costs may rise significantly due to site conditions; such as, higher land values, polluted soil conditions, inappropriate fill or placement of existing infrastructure. Therefore the MWMO may set limits on cost of stormwater treatment any site incurs in complying with the MWMO's Standards. A limit of the stormwater costs is needed to balance the environmental and financial tradeoffs to the public and private sectors to achieve the protection and restoration of the water quality and quantity in the watershed.

On occasion, the limiting conditions on urban sites may inflate the cost of site stormwater treatment to a level that exceeds what is reasonable to expect, so the MWMO will consider shifting the treatment to the next best site opportunity elsewhere in the watershed or further upstream. The opportunity lost, when this shift occurs, is the management of stormwater as close as possible to its source. Source management of stormwater is the preferred option for replicating a watershed's natural hydrologic cycle, limiting pollutant concentrations, and preventing higher downstream clean up costs.

Each year, at its annual meeting in January, the MWMO Board will review and set the limit for the cost of stormwater management to comply with the MWMO's Standards. The developer will need to demonstrate (via a feasibility study) that the cost limit set by the MWMO will be exceeded given site conditions. If the developer's findings are verified by the member's permitting staff and the MWMO the developer, public or private, may proceed to the alternative compliance options for the standard in question.

3.1.3 The MWMO's Standards Language

Note: The MWMO will be working with agencies and its member organizations over the next 2.5 years to revise or determine new water quality and volume standards.

1. **Stormwater Management Standards**
   - **a.** Any project creating greater than one acre of land disturbance is subject to the standards below.
   - **b.** The MWMO's Standards, or higher, must be adopted by local units of government and incorporated into their stormwater ordinance or other regulatory control.
   - **c.** In order to reduce regulatory complexity, a member may request the MWMO to allow stormwater rules set forth by adjacent watershed management organizations to govern development so long as they can be shown to be substantially equal to or greater than the level of protection afforded by the MWMO Standards.
   - **d.** Road mill and overlay project activities need only to comply with MWMO erosion and sediment control standards.
   - **e.** Projects involving installation of signs, lighting, signals, fence, noise walls, storm sewers, culverts, manholes and catch basins may be exempt from stormwater standards, if it can be demonstrated to the permitting entity and MWMO that the hydraulic and hydrologic capacity of soils to infiltrate and practices to convey water on site are the same or better than existed prior to the start of the project. The project will need to comply with MWMO erosion and sediment control standards.
   - **f.** The MWMO's Incentivized Standards set goals that achieve higher quality water resources in the MWMO. Only projects seeking funding from the MWMO need to consider these goals (see 3.1.4 The MWMO's Incentivized Standards**)**.

2. **Rate Control**
   - **a.** Runoff rates for the proposed activity shall not exceed pre-development runoff rates for the Type II distribution 2-, 10-, and 100-year critical storm events (as defined by TP-40 and/or subsequent revisions – see Table 3).
   - **b.** Runoff rates may be restricted to less than the pre-development rates when the capacity of the downstream conveyance system is limited.
   - **c.** The following pre-development curve numbers shall be used to evaluate this standard:

Hydrologic Soil Group	Curve Number
A	49
B	69
C	79
D	84

   - **d.** For rate control stormwater calculations a geotechnical evaluation is required to characterize the soils when site soils are shown as "Urban" in the latest version of the NRCS soil survey.

3. **Water Quality**
   - **a.** Projects shall achieve a removal of 90% TSS (Total Suspended Solids) from the 95th percentile daily rainfall total (currently 1.17 inches in 24hrs) over the entire area of the site (not just areas of the site being developed or disturbed).

4. **Volume (placeholder for future volume standard by ~ 2013)**

5. **Water Quality Alternative Compliance**

The following alternative compliance section is for sites that are not able to meet the MWMO's water quality standard for total suspended solids (TSS).

a. Common requirements for both public and private entities

- **i.** Only need to meet the MWMO standard once for a given site no double accounting where treatment or exemptions have occurred in the past
- **ii.** Practices must perform to MWMO's Standards. Developers must follow an inspection and maintenance schedule that has been approved by the permitting entity and correct any post construction performance issues that arise.
- **iii.** May pay a TSS lbs/ acre fee to cover the capital, maintenance, and replacement cost of a alternate or regional treatment facility
  - **1)** Fees should represent the true cost of: upfront capital costs; the operational and maintenance costs (lifecycle costs) of the practice.
  - **2)** Fees collected for regional treatment must be dedicated to stormwater management practices that remove the pollutants a fee is paid for. Cities will report to the MWMO annually on the stormwater account's revenues, expenditures and balance as well as the amount, type and location of where treatment has been added.

b. Common requirements for all MS4's and governmental organizations

- **i.** May accumulate IOU credits for the required pounds of TSS / acre that cannot be treated on the project site
  - **1)** The MWMO requires annual reporting of IOU credit balances. The report will be a record of the annual credit total, and site locations with the amount of credits accrued or debited.
  - **2)** All IOU credits need to be debited (used up) within five years of their inception or the approval of new permits may be held up.
  - **3)** May exchange IOU credits for excess regional treatment they have built
    - **i)** IOU's exchanged for regional treatment must be dedicated to stormwater management practices that remove the pollutant an IOU is charged for. Cities will report to the MWMO annually on the stormwater account's credits, debits and balance as well as the amount, type and location of where treatment has been added.
  - **4)** Trees in tight corridors may be used as a potential offset to meeting standards when water is directed to them and their benefits to volume, rate and water quality treatment can be quantified.

c. Exclusive conditions pertaining to MWMO member organizations

- **i.** IOU credits may be debited (used up) on other project sites within the MWMO and on upstream projects sites within the member's jurisdictional boundaries
  - **1)** Prior to the MWMO approving the use of IOU's outside of the watershed, member organizations will need to provide:
    - **a)** A feasibility study or demonstration of a site's limiting conditions that prevent complying with the MWMO's standard onsite
    - **b)** An evaluation of the member's future projects in the MWMO that demonstrates IOU credits cannot be debited (used up) on another project within a period of five years

c) For projects outside of the watershed, the MWMO's remaining treatment will be in addition to any local site volume, rate and water quality requirements

d. Exclusive conditions pertaining to the Minnesota Department of Transportation

i. Due to Minnesota Department of Transportation's right of way and land limitations within the MWMO, they may debit (used up) their IOU on other project sites within the MWMO and on upstream projects sites within the metro area

1) Prior to the MWMO approving project sites outside of the watershed, the Minnesota Department of Transportation will need to provide:

a) A feasibility study or demonstration of a site's limiting conditions that prevent complying with the MWMO standard onsite

b) An evaluation of future Minnesota Department of Transportation projects in the MWMO that demonstrates IOU credits cannot be debited (used up) on another project within a period of five years

2) Projects outside of the MWMO and its member organizations' boundaries shall only install volume control practices to meet the MWMO's water quality standard (see Volume Control Guidance under #7 below)

3) For projects outside of the watershed, the MWMO's remaining treatment will be in addition to any local site volume, rate and water quality requirements

4) Trees in tight corridors may be used as a potential offset to meeting standards when water is directed to them and their benefits to volume, rate and water quality treatment can be quantified. Trees may be installed per Mn/DOT Design Standards.

e. Exclusive conditions pertaining to private development project sites

i. Redevelopment timing accommodations for meeting water quality standards can be made by the permitting entity in their ordinance or rules for some phased redevelopment situations. IE: Stormwater treatment may not be required until the third phase of a shopping mall development or a certain revenue milestone in the development has been met.

ii. Private developers may transfer of TSS lbs/ acre between concurrent projects in the MWMO, if compliance with the MWMO standard cannot be met on the project site.

1) Prior to the permitting entity approving the transfer of TSS lbs/ acre between concurrent projects private developers will need to provide:

a) A feasibility study or demonstration of the donor site's limiting conditions that prevent complying with the MWMO's standard onsite

b) A feasibility study or demonstration that the host site will be able to accommodate the transferred amount for treatment in addition to any local site volume, rate and water quality treatment requirements.

2) Treatment for the transferred TSS lbs/ acre must be installed and operational on the host site prior to a final occupancy approval of the donor site

6. Volume Control Guidance (recommended procedures for volume control projects)

a. Infiltration volumes and facility sizes shall be calculated using the appropriate hydrologic soil group classification, ASTM Unified Soil Class Symbol and design infiltration rate from Table B. Select the design infiltration rate from Table B based on the least permeable soil horizon within the first five feet

below the bottom elevation of the proposed infiltration best management practice. The information provided in Table B is intended to be used in the following manner:

i. For preliminary design purposes, refer to the NRCS soil survey to identify the hydrologic soil groups found on site. This information provides a preliminary indication of the infiltration capacity of the underlying soils.

ii. After volume control/infiltration practices have been located on the grading plans, perform soil borings in the exact location of the proposed practices as described in the Minnesota Stormwater Manual (Minnesota Pollution Control Agency, 2008a) as amended. Soil borings should be logged using the USDA Soil Textural Classification System and the ASTM Unified Soil Class Symbol.

iii. The combination of all the aforementioned information will allow the designer to identify the appropriate design infiltration rate. As the Minnesota Stormwater Manual States, "these infiltration rates represent the long-term infiltration capacity of a constructed infiltration practice and are not meant to exhibit the capacity of the soils in the natural state". A permit applicant can submit field measurements and revised rates (using the correction factors provided in the Minnesota Stormwater Manual) if there is reason to believe the long-term infiltration rates will be other than the design infiltration rates provided in Table B.

b. A geotechnical investigation shall be performed in the location of the proposed volume control practices to confirm or determine underlying soil types, the depth to the seasonally high groundwater table, and the depth to bedrock or other impermeable layer.

c. The infiltration area shall be capable of infiltrating the required volume within 48 hours for surface and subsurface BMPs.

d. Infiltration BMPs must be designed to provide adequate pretreatment measures before discharge of runoff to the primary infiltration area.

e. Design and placement of infiltration BMPs shall be done in accordance with the Minnesota Department of Health guidance called "Evaluating Proposed Stormwater Infiltration Projects in Vulnerable Wellhead Protection Areas." (Final version to govern)

f. To calculate stormwater runoff under post-development conditions, the area of the site disturbed during construction shall be assigned a runoff curve number (CN-value) corresponding to a soil permeability class one step below that of the undisturbed soil unless the project approval from the city specified an approved method to restore the soil structure.

g. Specific site conditions may make infiltration difficult, undesirable, or impossible. Some of these conditions are listed in Table A.

Table A. Site Conditions Considered Undesirable for Infiltration BMPs

Type	Specific Site Conditions	Submittal Requirements
Potential Contamination	Potential Stormwater Hotspots (PSHs)	PSH locations and flow paths
	Contaminated Soils	State Permitted Brownfield Documentation, Soil Borings
Physical Limitations	Low Permeability (Type D Soils)	Soil Borings
	Bedrock within 3 vertical feet of bottom of infiltration area	Soil Borings
	Seasonal High Groundwater within 3 vertical feet of bottom of infiltration area	Soil Borings
	Karst Areas	Soil Borings
	Steep Slopes	Steep Slope Determination
Land Use Limitations	Utility Locations	Site Map
	Adjacent Wells	Well Locations

	Building Foundation	Ten (10) feet
Source: Modified from Capitol Region Watershed District Rules, Revised 03/05/2008		

TABLE B. Design Infiltration Rates			
Hydrologic Soil Group	**Soil Textures[1]**	**ASTM Unified Soil Class Symbols**	**Rate**
A	Gravel, sand, sandy gravel, silty gravel, loamy sand, sandy loam	GW, GP	1.63 in/hr
		GM, SW, SP	0.80 in/hr
B	Loam, silt loam	SM	0.60 in/hr
		ML, OL	0.30 in/hr
C	Sandy clay loam	GC, SC	0.20 in/hr
D	Clay, clay loam, silty clay loam, sandy clay, silty clay	CL, CH, OH, MH	0.00 in/hr
Source: Modified from Minnesota Stormwater Manual, November 2005			

[1] Adapted from the U.S. Department of Agriculture, Natural Resources Conservation Services, 2005. National Soil Survey Handbook, title 430-VI.

7. Maintenance

a. All stormwater management structures and facilities, including volume reduction BMPs, shall be maintained to assure that the structures and facilities function as originally designed. The maintenance responsibilities must be assumed by either the municipality's acceptance of the required easements dedicated to stormwater management purposes, or by the applicant executing and recording a maintenance agreement. The recordable executed agreement must be submitted to the municipality prior to issuance of the project approval from the city. Public developments will require a maintenance agreement in the form of a Memorandum of Agreement or an approved Local Water Management Plan that details the methods, schedule, and responsible parties for maintenance of stormwater management facilities for permitted development. A single Memorandum of Agreement for each local government unit may be used to cover all stormwater management structures and facilities required herein, including volume reductions BMPs, within the LGU's jurisdiction. This maintenance plan shall address snow management.

8. Drainage Alterations

a. No person shall alter stormwater flows (resulting in an increase in stormwater flows or a change in existing flow route) at a property boundary by changing land contours, diverting or obstructing surface or channel flow, or creating a basin outlet, without first obtaining a permit from the city.

9. Bounce and Duration Control

a. The project must meet hydroperiod standards adapted from "Stormwater and Wetlands Planning and Evaluation Guidelines for Addressing Potential Impacts of Urban Stormwater and Snowmelt Runoff on Wetlands," (Minnesota Stormwater Advisory Group, June 1997), as follows:

i. Wetland Susceptibility Class = Highly Susceptible; Permit Storm Bounce = Existing; Inundation Period for 2-Year event = Existing; Inundation Period for 10-year or Greater Event = Existing

ii. Wetland Susceptibility Class = Moderately Susceptible; Permit Storm Bounce = Existing plus 0.5 feet; Inundation Period for 2-Year event = Existing plus 1 days; Inundation Period for 10-year or Greater Event = Existing plus 7 days

iii. Wetland Susceptibility Class = Slightly Susceptible; Permit Storm Bounce = Existing plus 1.0 feet; Inundation Period for 2-Year event = Existing plus 2 days; Inundation Period for 10-year or Greater Event = Existing plus 14 days

iv. Wetland Susceptibility Class = Least Susceptible; Permit Storm Bounce = No Limit; Inundation Period for 2-Year event = Existing plus 7 days; Inundation Period for 10-year or Greater Event = Existing plus 21 days

10. Flood Control

a. All habitable buildings, roads, and parking structures on or adjacent to a project site shall comply with the following flood control and freeboard requirements:

i. Condition = New Habitable Buildings; Waterbodies with Piped Outlets and Mississippi River = Low floor must be a minimum of 2 feet above the 100-year flood elevation; Waterbodies without Piped Outlets = Low floor must be a minimum of 5 feet above the 100-year flood elevation; Subsurface Stormwater Management BMPs = Low floor must be a minimum of 2 feet above the 100-year flood elevation or 1 foot above the emergency overflow elevation unless floodproofing measures are constructed with the building; and Low opening must be a minimum of 2 feet above the 100-year flood elevation or 1 foot above the emergency overflow elevation.

ii. Condition = Existing Habitable Buildings (only for projects with >90% tear down) – Adjacent to and Potentially Affected by Flood Waters; Waterbodies with Piped Outlets and Mississippi River = Low opening must be a minimum of 2 feet above the 100-year flood elevation; Waterbodies without Piped Outlets = Low opening must be a minimum of 5 feet above the 100-year flood elevation; Subsurface Stormwater Management BMPs = Low floor must be a minimum of 2 feet above the 100-year flood elevation or one foot above the emergency overflow elevation unless floodproofing measures are constructed with the BMP; and Low opening must be a minimum of 2 feet above the 100-year flood elevation or 1 foot above the emergency overflow elevation.

iii. Condition = Underground Parking Structures; Waterbodies with Piped Outlets and Mississippi River = Low opening must be a minimum of 2 feet above the 100-year flood elevation; Waterbodies without Piped Outlets = Low opening must be a minimum of 2 feet above the 100-year flood elevation; Subsurface Stormwater Management BMPs = Low opening must be a minimum of 2 feet above the 100-year flood elevation or 1 foot above the emergency overflow elevation unless floodproofing measures are constructed with the BMP.

iv. Condition = Public Roadway; Waterbodies with Piped Outlets and Mississippi River = Roadway shall not flood when adjacent to Stormwater storage basin designed to store the 100-year storm event. Freeboard requirement set by road authority; Waterbodies without Piped Outlets = Roadway shall not flood when adjacent to stormwater storage basin designed to store the 100-year storm event. Freeboard requirement set by road authority; Subsurface Stormwater Management BMPs = Roadway shall not flood when adjacent to stormwater storage basin designed to store the 100-year storm event. Freeboard requirement set by road authority.

v. As an alternative, for Stormwater Management BMPs (BMP) designed to store significant runoff, the minimum freeboard requirement above the 100-year high water level may be calculated as the height determined by adding the depth over the Stormwater Management BMP above the 100-year high water level of the volume of runoff received by the BMP from a two year event.

11. Erosion and Sediment Control

a. Erosion and sediment control measures shall meet the standards for the General Permit Authorization to Discharge Stormwater Associated with Construction Activity Under the National Pollutant Discharge Elimination System/State Disposal System Permit Program, Permit MN R100001 (NPDES General Construction Permit), issued by the Minnesota Pollution Control Agency, except where more specific requirements are required.

b. Activity shall be phased to minimize disturbed areas subject to erosion at any one time.

c. All construction site waste—such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site—shall be properly managed and disposed of so they will not have an adverse impact on water quality.

d. Silt fence shall conform to sections 3886.1 and 3886.2, Standard Specifications for Construction, Minnesota Department of Transportation (2005 ed.), as it may be amended.

3.1.4 The MWMO's Incentivized Standards

All Member Grant, Greening and capital projects funded by the MWMO will need to meet the Standards defined in section 3.1.3 The MWMO's Standards Language. In addition, funding requests for capital projects that go

beyond MWMO's required standards and work towards achieving the following rate, water quality and volume goals will benefit during the MWMO's project selection process.

1. **Rate Control Goal**
   - **a.** Runoff rates shall not exceed historic runoff rates for the Type II distribution 2-, 10-, and 100-year critical storm events (as defined by TP-40 and/or subsequent revisions – see Table 3).
   - **b.** Runoff rates may be restricted to less than the historic rates when the capacity of the downstream conveyance system is limited.
   - **c.** To calculate stormwater runoff under historic conditions, the following historic curve number-values shall be used:

Hydrologic Soil Group	Curve Number
A	30
B	55
C	70
D	77

   - **d.** For rate control (goal) stormwater calculations the applicant shall use Figure 14 to determine the historic hydrologic soil group which will be matched with a historic curve number above. For those areas of the watershed (in Figure 14) classified as Urban - cut and fill land a geotechnical evaluation is required to characterize the present day soils which will be matched with a historic curve number above.

2. **Water Quality Goal**
   - **a.** The application area is the entire site (not just areas of the site being developed or disturbed). Stormwater best management practices should mimic, as close as feasibly possible, the site's historic water quality condition for the 95th percentile daily rainfall total (1.17 inches in 24hrs). Best management practices shall be selected on the basis of site-specific conditions, including soil types, depth to water table, and the presence of known or suspected contaminated soils.
   - **b.** To calculate stormwater runoff under historic conditions, the following historic CN-values will be used:

Hydrologic Soil Group	Curve Number
A	30
B	55
C	70
D	77

The MWMO encourages developers to use volume infiltration practices where site conditions are favorable. The MWMO prefers that sites with soils classified as Hydrologic Soil Group A or B meet the MWMO's water quality standard or goal through infiltration for at least that part of the site where Hydrologic Soil Group A or B soil is present. The corresponding ASTM Unified Soil Classification for Hydrologic Soil Group A and B soils is provided in Table B. If considering volume controls for a site see the Volume Control Guidance under 3.1.3.6 above.

3.1.5 Implementation of the MWMO's Standards

With respect to the financial impact of these standards, the MWMO does not foresee a significant increase in administrative, permitting, and enforcement costs for Local Units of Government adopting these standards. However, studies conducted by the MWMO do anticipate an increase in costs to public and private developers. Based on studies of public linear, residential, and commercial sites, developer costs are estimated to rise three to five percent with the adoption of the MWMO's Standards.

The MWMO is committed to ensuring the implementation of its standards in cooperation with member organizations. To promote consistency in application of the MWMO Standards, the MWMO recommends members adopt its ordinance-ready MWMO Standards language into their local ordinances. In addition, the

MWMO may provide training for local staff to ensure their familiarity with the standards. The MWMO may provide funding or staff to assist local inspection and enforcement efforts.

As required by statute, each member organization shall amend their local water management plans and adopt local controls that are consistent with the MWMO Standards in this Plan. An alternative compliance method to be approved by MWMO, either specific to these standards or consistent with the member organization's existing alternative compliance methods, can be part of the local controls. However, it is expected that alternative compliance methods would only be issued in the unique cases where specific and unique site conditions necessitate an alternative method to meet the goals of the MWMO Standards. It is expected that variances will be issued only in unique cases after all onsite and offsite alternative compliance options have been fully exhausted. The MWMO may allow a member community to comply with the rules and regulations of another watershed if the MWMO deems the standards of the other watershed management organization to be comparable to MWMO Standards set forth in this Plan. The MWMO Board of Commissioners reserves the right to review and comment on site alteration plans that affect the quality and quantity of water within and across its watershed and subwatershed boundaries.

To ensure ongoing improvement of the standards and their enforcement, the MWMO will convene annual meetings with member organizations and adjacent watersheds to review implementation of the standards and enforcement procedures (see Appendix I). Based on the results of these meetings the MWMO may revise the MWMO Standards and/or work with the cities to design more efficient and effective implementation and enforcement processes that ensure the protection of natural and water resources in the MWMO. A summary of this meeting will be provided in MWMO's annual report to BWSR.

If the MWMO determines that a member organization is not adequately carry out the implementation and enforcement of the (stormwater related) local controls enacted then, the MWMO will, at its discretion, assume partial or all permitting and enforcement responsibilities and hold the member organization accountable for costs associated with activities the organization failed to perform.

Evaluation of the effectiveness of MWMO's Standards and enforcement will be based in part on monitoring of the water resources and installed practices in the MWMO. The MWMO may also conduct periodic on-site reviews of permitted activities within member organizations' jurisdictions.

3.2 Local Water Management Plans: Adoption Timeline

Member organizations are responsible for preparing and adopting a local water management plan that is consistent with the MWMO Plan. The local water management plan must include information on land use, stormwater runoff, stormwater storage, water quality, and implementation methods to protect local resources. The specific content requirements of local water management plans are found in this section and defined in Minnesota Statue 103B.235 and Minnesota Rule 8410.0160 and 8410.0170 and revisions to these (see Appendix D and G).

During the interim period between MWMO Plan adoption and local government adoption of local/official controls (IE: ordinances), the MWMO may work with local governments to revise and adopt their controls to incorporate the MWMO Standards. As the ordinance comparison table contained in Appendix H illustrates, member communities already have rule language similar to that proposed by the MWMO. Within this interim period, member communities can receive assistance in reviewing and ensuring compliance with MWMO Standards.

The local water management plans must be consistent with all of the Watershed Management Plans that fall within the municipal boundary. Each local water management plan must be approved by the MWMO and adopted by the Local Government Unit within 2 years of this plan's final approval by Board of Water and Soil Resources. The MWMO will notify each member organization of the requirement to revise or prepare local water management plans that conform to this Plan following approval by Board of Water and Soil Resources of the Watershed Management Plan.

The deadline for Member organizations to adopt of local water management plans is May 2013. Additionally, local/official controls (IE: ordinances) need to be updated to reflect the standards of the plan within 2 years and 3 months of this plan's final adoption by the MWMO. Implementation and enforcement of these local/official controls needs to start within 2 years and 6 months of this plan's final adoption by the MWMO. The MWMO's future volume standard will need to be adopted and implemented within 3 years of this plan's final adoption by the MWMO. To achieve this deadline, member cities will likely need to carryout Local Water Management Plan updates concurrently with their process to develop, adopt and implement the local controls, see Appendix R for a Minneapolis examples. The Minnesota Department of Transportation will also need to be operating in compliance with the MWMO's Standards within 2 years and 6 months of this plan's final adoption by the MWMO. The MWMO's future volume standard will need to be adopted and implemented within 3 years of this plan's final adoption by the MWMO.

Table 3: Local Water Management Plan Amendment review and approval timeline; Adoption of Local Water Management Plan revisions into local/official controls; Implementation of adopted local/official controls

2011 - May	MWMO Plan Approved by BWSR and Adopted by MWMO
2012 - October	Deadline for Submittal of Local Water Management Plans to MWMO, County, and Metropolitan Council
2012 - December	MWMO Receives Comments on Local Water Management Plans from County and Metropolitan Council
2012 - December	MWMO Provides Comments on Local Water Management Plans
2013 - January	MWMO Approves or Denies Local Water Management Plans or Member Organizations Agree to Extension
2013 - February	Deadline for Local Water Management Plan Approval by MWMO
2013 - May	Deadline for Member Organizations to Adopt Local Water Management Plans
2013 - August	Member Organizations Adopt Local/Official Controls
2013 - November	Member Organizations Start to Implement and Enforce Local/Official Controls
2014 – May	Member Organizations Start to Implement and Enforce Local/Official Controls related to volume.

A tracking, review and assistance process will follow the approval and adoption of the MWMO's Watershed Management Plan. During the first two and a half years the MWMO will work with the cities to adopt the MWMO's Standards into their Local Water Management Plans and local/official controls, and ultimately to implement and enforce these local/official controls.

The MWMO will assemble a technical advisory group from our member organizations and others to review the costs to implement, enforce, and construct to the MWMO Standards. The MWMO will evaluate if stormwater management costs per site are in line with the initial estimates used to set the standards. Cities and developers will be asked to provide project cost details for this analysis. See Appendix I for a list of materials to be submitted.

Given the findings of this review, the MWMO and its members will assess whether the MWMO's Standards are being carried out and ultimately result in an annual decision to maintain or modify the existing process for achieving the goals of the MWMO and its members.

Over time the MWMO will determine the effectiveness of stormwater management efforts in the Watershed by correlating the intended impacts of best management practices installed in a given subwatershed with changes in pollutant concentrations found in that subwatershed. In this manner, monitoring data on end of the pipe concentrations discharging to the river will be used to adjust management efforts over the long term. The MWMO will also collect in-stream Mississippi River data and review the long term cumulative impact occurring from all pipes discharging into the Mississippi River within the MWMO. Ultimately these findings will guide decisions on whether the MWMO's Standards are sufficient to achieve the goals of the MWMO and its members.

If the MWMO determines that a member organization is not taking the necessary steps to complete, within the timeframe provided in Table 3, one or more of the following actions:

1. Amended its local water management plan
2. Followed through with adoption to local controls
3. Carried out enforcement/implementation of local controls enacted

Then the MWMO will, at its discretion, assume partial or all permitting and enforcement responsibilities and hold the member organization accountable for costs associated with activities the organization failed to perform.

3.3 Local Water Management Plans: General Review Procedure (for reviews not associated with a MWMO 10-year plan update)

The MWMO is required to review and approve local water management plans and amendments that impact water and natural resources. Local water management plans must be submitted to the MWMO with adequate time to complete the review process prior to the required deadline for local water management plan adoption (MN Rules 8410.0160, see also Appendix G). It is expected that local water management plans will undergo a full update at least once every 10 years. The review and approval process for local water management plan amendments and updates is the same as the process for the original approval of the local water management plan amendments. The updated plan should be submitted for review to MWMO, County, and Metropolitan Council. The County and Metropolitan Council have 45 days to review and provide comment on the updated plan. The MWMO has 60 days to provide comment on the updated plan and approve or disapprove the plan. The review by Metropolitan Council, County, and MWMO run concurrently.

After the MWMO has responded to the initial submittal of the draft plan, additional review is conducted cooperatively and is not governed by a formal review process timeline. However, once a plan is received by MWMO, the MWMO will respond within 60 days with the Board's action of approved or denied or will request an extension of the review period from the member organization. If the member organization has not agreed to an extension and the MWMO has not acted on the plan within 60 days, the plan is deemed approved [103B.235 sub 3]. The MWMO expects to request a maximum total review extension of 120 days.

3.4 Local Water Management Plans: Content Requirements

Minnesota Statutes, section 103B.235 and Minnesota Rule 8410, discuss the particular requirements and format of a local water management plan (see areas in Appendix D and G). The MWMO is especially interested in problems identified in the local water management plan and corrective actions that affect the MWMO concerns stated in this Plan or that require MWMO collaboration.

Member organizations may adopt by reference all, or part, of this MWMO Plan. If a member organization does not adopt the MWMO Plan, their local water management plan will need to meet the requirements outlined in Minnesota Statutes, section 103B.235 and Minnesota Rule 8410.0170, as well as the content in Table 4 below. If a member organization partially adopts the MWMO Plan then any requirements in the MWMO Plan not adopted will need to be completed and included in their local water management plan, along with the content described in Table 4. Member organizations that adopt by reference all of the MWMO Plan into their local water management plan also need to complete and include content elements found in Table 4 in their local water management plan.

Table 4: Local plan content requirements

Water, Natural Resources, and Land Use Goals and Policies

- Include goals and policies to address those problems identified in the MWMO Plan that affect the community (see Appendix O and Focus Statements in Table 20).
- Include current and future land use maps and a description of the impervious surface cover expected for the allowed uses.
- Include wetlands, natural resources, and land conservation areas identified by the municipality.
- Identify land use controls necessary to provide protection or improvement of water and natural resources.
- Summarize all Total Maximum Daily Load (TMDL) compliance requirements for the city.
- Summarize all current activities completed to date to comply with (TMDL) requirements.

Infrastructure Assessments and Programs

- Include a stormwater storage and conveyance map identifying location, size, and remaining capacity of stormwater management features including stormwater storage, water quality treatment, infiltration, and conveyance infrastructure. Include stormwater best management on all public and private properties that have been reviewed, approved, or funded by the city.
- Identify changes in capacity of stormwater management features needed to address storage, infiltration, water quality treatment, and conveyance under current and future land use.
- Identify programmatic, non-structural or structural solutions to address the identified problems.
- Include a map identifying locations of planned or potential regional or local stormwater management facilities.
- Identify any implementation programs, maintenance activities, or capital improvement programs where MWMO funding or assistance is desired.
- Provide a schedule and annual process for assessing the need for water resource-related capital improvement programs or projects in the city.
- Provide a summary of the member organizations' Storm Water Pollution Prevention Program and conformance with the requirements of the Environmental Protection Agency's National Pollutant Discharge Elimination System (NPDES) for municipal separate storm sewer systems (MS4s) or summarize relevant plans and programs of the member organization that address:
    - Inspection and maintenance plans (wet ponds, infiltration basins, raingardens, stormsewer systems, etc.)
    - Street sweeping, right-of-way maintenance, road icing, salt storage, snow plowing and snow storage programs
    - Spill response and containment plans

MWMO Standards

- Identify how the member organization intends to implement and enforce each standard established in the MWMO's Watershed Management Plan.
- Outline the member organizations' permitting and/or site review processes for MWMO Standards.
- Include draft ordinances that are at least as restrictive as MWMO Standards.

Surface Water Appropriations

- Identify city permitting fees and requirements for surface water appropriations that draw less than 10,000 gallons per day or 1 million gallons per year.(See MS 103B.211, subdivision 4, and MS 103G.271, subdivision 4).

Evaluation

- Identify how improvement is shown through implementation of the local water management plan

The member organizations should determine if other management programs are necessary to meet their local water management plan goals, and the goals of this Plan.

The MWMO will discuss with each member organization the options that address its circumstances and will collaboratively determine the most practical approach to meeting the requirements of this Plan and Minnesota Rules Chapter 8410. The MWMO understands the need to be sensitive to consistency with adjacent watershed districts and water management organizations. Coordination is required to successfully implement watershed standards and projects and maintain the integrity of the MWMO's goals. The MWMO will work closely with cities as needed in local water management plan preparation, review, and implementation. The MWMO will apply its goals, objectives, and policies to its review of local water management plans.

3.5 General Compliance Requirements

1. Make Local Water Management Plans available at city offices and provide the MWMO an office reference copy.

2. The MWMO requires member cities to have a Department of Natural Resources approved Floodplain Ordinance and a Department of Natural Resources approved Shoreline Ordinance. If no ordinance is applicable, the MWMO requires that there be no encroachment on floodways that results in reduced capacities or expedited flood flows. The only structures allowed in the flood zone are those that have been floodproofed and approved by the Department of Natural Resources.

3. Member cities are required to comply with Total Maximum Daily Load (TMDL) requirements as required by their respective MS4 permits.

4. Member cities are required to address the following stormwater management and stormwater maintenance standards in a manner consistent with MWMO Standards, applicable Total Maximum Daily Loads (TMDL) and National Pollutant Discharge Elimination System (NPDES) standards for municipal separate storm sewer systems (MS4s):
   - Target pollutant loads
   - Maximum allowable runoff rates(MWMO standard)
   - Design criteria for stormwater structures addressing floatable materials and maintenance
   - Design criteria for stormwater facilities to address target pollutant loads
   - Schedule for street sweeping, stormwater facility inspection, and maintenance
   - Spill containment and clean-up plan

5. Member cities are required to develop, implement and enforce a permitting program for surface water appropriations that draw less than 10,000 gallons per day or 1 million gallons per year.(See MS 103B.211, subdivision 4. and MS 103G.271, subdivision 4.). Cities should request an associated permit fee amount to be established by the MWMO.

3.6 MWMO and All Water-Related Authorities

The MWMO is formed under a Joint Powers Agreement in accordance with the Minnesota Statute Section 103B. Joint Powers Agreements may have a narrowing or broadening effect on the authorities allotted to Watershed Management Organizations by Minnesota Statute Section 103B. Authorities held in common by all member cities may be transferred to the Watershed Management Organization, with the exception of revenue-related authorities. However, the MWMO's current Joint Powers (Cooperative) Agreement does not narrow or expand the authorities allotted by Minnesota Statute Section 103B.

The Water Resource-Related Activities of MWMO Member Organizations table (Appendix J) identifies the water resource-related activities of each member organization and the MWMO. The Wetland Conservation Act authority held in common by the cities is an example of an authority that could be wholly or partially transferred to the MWMO. This table should also be utilized for identifying partnership opportunities that generate synergies and efficiencies in managing water resources in the Watershed.

Appendix J Table Layout and Content Guidance
The table is organized by the "regulated water feature" (e.g. wetland, surface waters, navigable waters, and so on). These water categories were chosen because they often have a spatial dimension and they reflect common areas for water resource laws and regulations. Within each water category there are related subtopic areas. See Appendix J for definitions on each subtopic area.

In the table, the MWMO and member organizations are shown as having either "Authority" or "Responsibility" activity types related to each water subtopic. The following definitions define the meaning of these terms for use in Table 5 (included as Appendix J):

Authority - authority refers to a claim of legitimacy, the justification and right to exercise police powers. Police power is the capacity of a government authority to regulate behaviors and enforce order within its territory, often framed in terms of public welfare, security, health, and safety. Regulations pertaining to the environment and aesthetics have been ruled by courts to be within the police powers of government. The exercise of police power can be in the form of making laws, and compelling obedience to those laws through physical means with the aim of removing liberty, introducing legal sanctions, or other forms of coercion and inducements. In this project, activities defined as "authority" most often include permitting, ordinance development, enforcement, and approval of a plan, project, or program by some other entity. It also includes ability to elevate a particular strategy or issue to a higher authority or additional level of review.

Responsibility – responsibility includes a variety of activities that government is required, either by law or by choice, to conduct. This may include planning activities that set strategy and program direction; capital improvement programs; informational programs such as monitoring, data gathering, and reporting; and reviewing and commenting on others' plans and programs. Responsibility may also include grants and other incentive programs to encourage behavior.

The Water Resource-Related Activities of MWMO Member Organizations Table 5 in Appendix J is a subset of information from a more extensive study the MWMO has completed identifying all of the entities with water-related jurisdictional authorities and responsibilities operating within the MWMO. Contact the MWMO to request a copy of this study.

3.7 Accessing MWMO Funding
This Plan establishes a number of programmatic areas designed in part to complement local projects and program efforts with MWMO funds. Local projects and programs need to align with MWMO goals in order to qualify for Member Grant and Land Conservation programmatic funding. Member organizations and others seeking funding will need to seek out and propose projects that primarily improve water resources.

All Member Grant, Greening and capital projects funded will need to meet the MWMO's Standards and submit a diagnostic and feasibility study with the funding request. Once adopted by member cities (the standards) or permitted by the MWMO, only the cost of the portions of the project that exceed MWMO's Standards may be funded. In limited cases the MWMO may, however, consider funding projects that do not fully meet the MWMO Standards if the project is highly effective or innovative. (See Table 6 below for a list of all funding details and see 3.1.3 The MWMO's Standards Language and Appendix F). The MWMO is particularly interested in funding demonstrations of new technologies, practices, and programs relating to improving the health of water resources.

To streamline the Member Grant funding process, members' implementation schedules for water resource-related Capital Improvement Projects should align with the MWMO's Member Grant process. Member Organizations and other governmental entities seeking Member Grant funding are encouraged to involve MWMO staff early in the project's schematic design process (Appendices T and R). Potential grantees need to provide a one-year funding request notice, from spring to spring. For example, funding requests received in the spring of 2010 will be considered for the 2012 budget cycle. Member Grant projects in this Plan will feed into programmatic and individual annual work plans and funding reviews.

Table 6: MWMO funding details

1. Member Grant, Greening and Land Conservation projects must meet the following project selection criteria:
   - Projects selected must meet the objectives found within the program's description (see 7.0 MWMO Administration/Internal Operations section of this plan)
   - Projects selected must result in a direct connection to cleaner water, an environmentally literate public, and a healthier ecosystem
   - Projects selected must provide measurable outcomes for the Watershed's natural resources
   - Projects selected must meet or exceed MWMO Standards*
   - Projects must support current subwatershed management goals
   - Projects selected must meet MWMO design guidelines

2. The MWMO limits its funding of water recreational facilities to those projects that bring water resources and related terrestrial and aquatic habitat closer to achieving a fishable and swimmable condition.
3. Any requested investments in property will need to demonstrate how the amount requested is proportional to achieving MWMO goals for conservation, preservation, and improvement of water quality, water quantity, wetlands, and habitats.

4. Member Grant project funding for water resource-related elements:
   a. Prior to the cities adopting the MWMO's standards, all projects receiving MWMO funds will need to meet the MWMO Standards and design guidelines. The MWMO may pay for the incremental increase in cost of water-related elements between the existing regulations and MWMO's Standards.
   b. 2 years and 6 months after the approval of this plan, or sooner, projects receiving MWMO funds will need to meet the MWMO standards and design guidelines. The MWMO may pay for the cost of water-related elements above and beyond the MWMO's standards.

* In limited cases the MWMO may consider funding projects that do not fully meet the MWMO standards if the project is highly innovative or successful in producing a desired or intended result in regards to cost and stormwater treatment needs in the Watershed.

The most recent version of the following Capital Improvement Programs/Projects (CIPs) or similar documents will be used to guide future Member Grant requests.

- Minneapolis Capital Improvement Projects, Mayor's Proposed 2009 – 2013 Capital Plan (web-based, Map Date: October 21, 2008)
- Lauderdale Draft Capital Improvement Plan 2008 to 2017 (July 14, 2008)
- Hennepin County 2009-2013 Transportation CIP (web-based, version 1.16, December 16, 2008)
- US Army Corps of Engineers (USACOE) Projects, Studies, and Managed Facilities Finder (web-based, List Date: March 18, 2009)
- Ramsey County Groundwater Protection Plan (2009)
- The City of St Anthony Village's Comprehensive Plan (2008)
- Minneapolis Park and Recreation Board Comprehensive Plan (2007)

In addition to the CIPs received, we were also made aware of a variety of small area or neighborhood-scale plans. Figure 2 shows a location map for the special area plans provided. The following plans are shown on Figure 2:

ID#	Plan Name	Year
▪ 1	Bryn - Mawr Neighborhood Land Use Plan	2005
▪ 2	Elliot Park Neighborhood Master Plan	2003
▪ 3	Master Plan for the Marcey Holmes Neighborhood & Supplement	2007
▪ 4	Corcoran Midtown Revival Plan	2002
▪ 5	Above the Falls - A Master Plan for the Upper River in Minneapolis	2000
▪ 6	Near Northside Master Plan	2000
▪ 7	Uptown Small Area Plan	2008
▪ 8	Northside Jobs Park Design Guidelines	1997
▪ 9	Cedar Riverside Small Area Plan	2008
▪ 10	Southeast Minneapolis Industrial (SEMI) / Bridal Veil Refined Master Plan	2001
▪ 11	Steward and Longfellow Greenway Area Land Use and Predevelopment Study	2007
▪ 12	38th Street and Chicago Avenue Small Area/Corridor Framework Plan	2008
▪ 13	Downtown East/North Loop Master Plan	2003
▪ 14	Audubon Park Neighborhood Master Plan	2008
▪ 15	Lowry Avenue Corridor Plan	2002
▪ 16	West Broadway Alive	2008
▪ 17	Development Objectives for North Nicollet Mall	2000
▪ 18	Central Avenue Small Area Plan	2008
▪ 19	University Avenue SE & 29th Ave SE Development Objectives and Design Guidelines	2007
▪ 20	Midtown Minneapolis Land Use Development Plan	2005
▪ 21	Lyndale Avenue: A Vision	2007
▪ 22	Nicollet Avenue: The Revitalization of Minneapolis Main Street	2000
▪ 23	Midtown Greenway Land Use and Development Plan	2007
▪ 24	Historic Mills District Master Plan and Update	2001
▪ 25	Grain Belt Development Objective	1996
▪ 26	Hi-Lake Shopping Center Development Guidelines and Objectives	2001
▪ 27	Hiawatha/Lake Station Area Master Plan	2001
▪ 28	46th Street Station Area Master Plan	2001
▪ 29	38th Street Station Area Plan	2006
▪ 30	Franklin-Cedar/Riverside Area Master Plan	2001

3.8 Financial Impact of this Plan on Member Organizations

This plan lays out requirements for local water management plans, sets standards to be implemented by the member organizations, and outlines MMWO partnership and funding opportunities for member organization. The plan does not outline specific capital improvements or other projects for member organizations. Costs to member organizations associated with the implementation of the requirements of this plan will include the development or revision of local water management plans, the development or revision of ordinances to address MWMO standards, the implementation of standards in member organization projects, and the completion of project reviews based on adopted standards. The MWMO's Member Grant funding program will assist the member organizations in paying for capital improvement projects that meet the goals and standards of the MWMO. MWMO also provides funding through other programs to assist with planning, monitoring, science, education, and assessment activities.

Figure 2: Location map for the special area plans

CHAPTER 54. STORM WATER MANAGEMENT

54.10. Authority. This ordinance is adopted pursuant to the authorization and policies contained in Minnesota Statutes, Chapters 103B and 462, and Minnesota Rules, Chapters 8410 and 8420. (99-Or-156, § 1, 11-24-99)

54.20. Purpose. The purpose of this ordinance is to minimize negative impacts of storm water runoff rates, volumes and quality on Minneapolis lakes, streams, wetlands, and the Mississippi River by guiding future significant development and redevelopment activity, and by assuring long-term effectiveness of existing and future storm water management constructed facilities. Chapter 54 establishes standards and specifications for conservation practices and planning activities in order to achieve policies regarding water resource management, flood control, and other community services as described in city, regional, state, and federal documents and statutes. (99-Or-156, § 1, 11-24-99)

54.30. Minneapolis Storm Water Management Design Manual (Design Manual). The Design Manual is the compilation of design performance, and review criteria approved by the city engineer and adopted by the city council for storm water management practices. In any event of apparent non-conformance, the city council shall adopt a resolution that establishes an interim design manual, design performance standards, and review criteria. In the absence of an adopted Minneapolis Storm Water Management Design Manual, the publication entitled Protecting Water Quality in Urban Areas: Best Management Practices For Minnesota prepared by the Minnesota Pollution Control Agency (MPCA), October, 1989, and subsequent updates, shall serve as the approved Design Manual. Copies of the Design Manual can be obtained from the Minneapolis Department of Public Works. (99-Or-156, § 1, 11-24-99)

54.40. Definitions. For the purposes of Chapter 54, the following terms, phrases, words, and their derivatives shall have the meaning stated below:

Applicant is any person who submits a Storm Water Management Plan pursuant to this ordinance and the person's agents, employees, and others acting under this person's direction.

Assistant city coordinator of regulatory services is the Assistant City Coordinator of Regulatory Services of the City of Minneapolis and the assistant city coordinator's duly authorized designees.

Best Management Practices (BMP) --See Storm Water Management Best Management Practices.

City engineer is the City Engineer/Director of Public Works of the City of Minneapolis and duly authorized designees.

Clearing and grubbing is the cutting and removal of trees, shrub, bushes, windfalls and other vegetation including removal of stumps, roots, and other remains.

Connected actions --See phased or connected actions.

Constructed facilities --See storm water management constructed facilities.

Detention facility is a natural or built structure that provides for the temporary storage of storm water runoff and release at controlled rates.

Design Manual --See Minneapolis Storm Water Management Design Manual, Section 54.30.

Impervious surface is one that does not allow rainfall to soak into the ground, including but not limited to the rooftops and paved areas such as roads, parking lots, driveways, sidewalks and plazas.

Issuing authority for Storm Water Management Plan approval and certification is the city engineer and for registration and maintenance is the director of regulatory services.

Land disturbing activity is any land change, including phased or connected actions, within the City of Minneapolis including, but not limited to, building demolition, clearing and grubbing, grading, excavating, transporting and filling of land, or other changes of the land surface including removing vegetative or impervious cover.

Minneapolis Storm Water Management Design Manual --See Section 54.30.

Mitigation is avoiding, minimizing, rectifying, or compensating for impacts.

Non-structural best management practices --See Best Management Practices.

Owner is any person with a legal or equitable interest in the land that includes one (1) or more storm water management constructed facilities.

Person is any individual, firm, corporation, partnership, franchisee, association or governmental entity.

Phased or connected actions are as defined by Minnesota Environmental Review Rules, as follows:

(1) *Phased action* means two (2) or more projects to be undertaken by the same proposer that the city engineer determines:

a. will have environmental effects on the same geographic area, and
b. are substantially certain to be undertaken sequentially over a limited period of time.

(2) *Connected actions:* Two (2) projects are "connected actions" if the city engineer determines they are related in any of the following ways:

a. one (1) project would directly induce the other;
b. one (1) project is a prerequisite for the other; or
c. neither project is justified by itself.

Pollution is the human-made or human-induced alteration of the chemical, physical, biological or radiological integrity of an aquatic ecosystem.

Project is an undertaking that involves land disturbing activities, including phased or connected actions.

Public waters are waters identified under Minnesota Statutes, Section 103G.005, Subdivision 15.

Receiving water body is the initial lake, stream, river, or wetland into which site runoff is conveyed whether directly or through the public storm drain system.

Regional storm water facility is a natural or built structure or device within the project's receiving water body drainage area, when so designated by the city engineer.

Responsible party is the property owner and agents, employees, and others acting under the property owner's direction.

Retention facility is a natural or built structure that provides for the storage of storm water runoff by means of a permanent pool of water.

Runoff is rainfall, snowmelt, or irrigation water flowing over the ground surface.

Sediment is soils or other surficial materials transported by surface water as a product of erosion.

Site is the land on which the project, including phased or connected actions, is located.

Site plan is a plan or set of plans showing the details of any land disturbing activity including, but not limited to, the construction of structures, open and enclosed drainage facilities, storm water management facilities, parking lots, driveways, curbs, pavements, sidewalks, bike paths, recreational facilities, ground covers, plantings, and landscaping.

Soil is naturally occurring surficial deposits overlying bedrock.

Storm Water Best Management Practices (BMPs) are practices, techniques, or measures which are proven to be effective in managing one (1), or more than one (1), of the following: storm water runoff rate, storm water runoff volume, pollutants conveyed by storm water runoff, sediment conveyed by storm water runoff. Best management practices include, but are not limited to, official controls, structural and nonstructural best management practices, and operation and maintenance procedures. A partial list of structural best management practices and devices includes pond systems/detention basins, infiltration, bioretention and vegetated channels, grit chambers, oil/water separators, filtration systems, and diversions. A partial list of non-structural best management practices includes lawn care education, organic litter management, street sweeping, catch basin stenciling, and catch basin cleaning. BMPs are further defined in the design manual.

Storm water hotspot is a land use or activity that generates higher concentrations of hydrocarbons, trace metals or toxicants than are found in typical storm water runoff.

Storm water management is the collection, conveyance, storage, treatment and disposal of storm water runoff in a manner to minimize channel erosion, flood damage, or degradation of water quality and in a manner to protect and enhance the environment, public health, safety, and general welfare.

Storm water management devices include, but are not limited to, constructed wetlands, wet ponds, wet extended detention ponds, pocket ponds, multiple pond systems, settling basins, infiltration trenches or basins, filter systems bioretention areas, dry or wet swales, grass channels, waterways, rooftop detention, skimming devices, grit chambers, sweeping, and diversions.

Storm water management goals are based on the receiving water body and emphasize overall volume reduction, nutrient reduction for storm water discharge to lakes, rate control for storm water discharge to streams, and suspended solids removal for storm water discharge to the Mississippi River.

Storm Water Management Plan (Plan) is the set of drawings, calculations, and other documents that comprise all of the information and specifications for the drainage systems, structures, concepts and techniques that will be used to control storm water as required by this ordinance and the design manual.

Storm water pond is a facility capable of holding water on a long-term seasonal or permanent basis (retention), or a short-term basis (detention), the purpose of which is to collect runoff, nutrients, and sediment prior to releasing water into wetlands, lakes, streams, and rivers.

Storm water runoff is the direct response of a watershed to precipitation or snowmelt and includes runoff that enters a ditch, stream, storm drain or other concentrated flow.

Structural best management practices --See Storm Water Best Management Practices.

Structure is anything manufactured, constructed or erected that is normally attached to or positioned on the land, including portable structures, roads, parking lots, and paved storage areas.

Water quality refers to those characteristics of storm water runoff that relate to the physical, chemical, biological, or radiological integrity of water.

Water quantity refers to those characteristics of storm water runoff that relate to rate and volume.

Watershed is the drainage area contributing storm water runoff to a specific receiving body of water or watercourse such as a lake, creek, or river.

Wetlands are waters identified under Minnesota Statutes, Section 103G.005, Subdivision 19. (99-Or-156, § 1, 11-24-99; 2006-Or-052, § 1, 5-12-06)

54.50. Applicability. Chapter 54 establishes requirements for land disturbing activities

on-sites greater than one (1) acre including phased or connected actions, and for existing storm water constructed devices.

(1) *Land-disturbing projects.* All land-disturbing projects on sites in excess of one (1) acre, including phased or connected actions, shall be served by storm water facilities, on or off site or a combination thereof, designed to meet or exceed targets according to the type of receiving water body as prescribed in the design manual. Land use and building permits will not be issued until a Storm Water Management Plan has been approved. On-site devices are subject to annual site registration, annual inspection, and adherence to maintenance rules prescribed in the design manual.

(2) *Pre-existing storm water management constructed devices.* Storm water facilities in existence prior to Chapter 54 are subject to annual site registration, annual inspection, and adherence to maintenance rules prescribed in the design manual. (99-Or-156, § 1, 11-24-99)

54.60. Exemptions. The following activities are exempt from requirements of Chapter 54:

(1) Storm water management plan requirements of Chapter 54.50(1) for any project that has received all necessary approvals from the city on or before the effective date of this ordinance.

(2) Emergency work to protect life, limb, or property.

(3) Any reconstruction project of an existing roadway, bridge, pathway or walkway where the increase in impervious surface area is one (1) acre or less.

(4) Installation of fence, sign, telephone, electric or other kinds of posts or poles. (99-Or-156, § 1, 11-24-99)

54.70. Responsibility prior to construction. Land use and building permits will not be issued until a Storm Water Management Plan has been approved.

(1) *Storm Water Management Plan application and approval.* The procedure for application for Storm Water Management Plan approval by the city engineer is contained in the design manual.

a. *Manual.*

1. *On-site management.* Measures to achieve storm water management standards should be incorporated on all sites to the greatest extent possible.

2. *Full or partial off-site management (participation in a regional facility).* When due to development density, topographic features, or soil or vegetation conditions, the responsible party may apply for approval of full or partial participation in existing regional storm water facilities within the drainage area of the same receiving water body, or regional storm water facilities within the drainage area of the same receiving water body that are substantially certain to be developed, or, if none exist, other storm water mitigation programs in the City of Minneapolis. The design manual shall provide the method for calculating cost of full or partial off-site management in lieu of full on-site management. Off-site management may not circumvent the general purposes and intent of this ordinance.

3. *Storm water management standards.*

i. *Standards according to receiving waterbody.* Storm water management standards include, but are not limited to, reduction of suspended solids discharged to the Mississippi River, controlled rate of discharge to streams, and reduction of nutrients in storm water draining to lakes or wetlands. Minimum requirements for pollutant removal including total suspended solids removal, discharge rate control, and nutrient load reduction according to type of receiving water body are prescribed in the design manual.

ii. *Storm water management devices.* When development density, topographic features, and soil and vegetation conditions are not sufficient to adequately handle storm water runoff using natural features and vegetation, constructed facilities or combinations of constructed facilities

shall be used. Types of constructed facilities include, but are not limited to, wetlands, wet-ponds, wet extended detention ponds, pocket ponds, multiple pond systems, setting basins, infiltration trenches or basins, filter systems, bioretention areas, dry or wet swales, grass channels, waterways, rooftop detention, skimming devices, grit chambers, sweeping and diversions. Suitability factors include, but are not limited to, development density, underlying soils, existing vegetation, drainage, location of utilities, aesthetic and recreational use, and management considerations.

iii. *Minimizing land disturbance.* Development shall be planned and conducted in a manner that will minimize the extent of disturbed areas, runoff velocities, erosion potential, and reduce and delay runoff volumes. Disturbed areas shall be stabilized and protected as required in Chapter 52 of this Code.

iv. *Maximizing infiltration.* To the greatest possible degree (except in the case of storm water hotspots), natural drainage ways and vegetated soil surfaces should be used to convey, store, filter, and retain storm water before discharging runoff into public waters or the public storm drain system. Opportunities for maximizing infiltration include minimizing the extent of impervious surfaces and directing runoff from impervious surfaces and from roof gutter systems onto lawns or other pervious surfaces.

v. *Rate control.* Changes in land cover effect changes in storm water runoff rates. Rate increases can degrade receiving water bodies or conveyance facilities or can cause flooding. Development should be planned in a manner that does not increase peak flows.

vi. *Ongoing maintenance.* No storm water facilities shall be approved without a maintenance plan that defines the maintenance regimen, including type and interval of maintenance and party to conduct such maintenance.

vii. *Accessibility for maintenance.* All public and private owned storm water management facilities shall provide an unobstructed access path capable of supporting light truck traffic during normal weather for the purpose of conducting inspections of the facility and maintenance thereof, unless waived by the city engineer.

viii. *Easement.* No storm water facility shall be approved unless all necessary access easements are provided to the City of Minneapolis.

ix. *Impacts on other properties.* No Storm Water Management Plan shall be approved without written agreement among affected property owners regarding changes in drainage or other impacts or possible impacts of storm water management.

x. *Conformity with other requirements.* Storm Water Management Plans must conform to all applicable federal, state, city, and water management organization statutes, ordinances, and regulations.

4. *Conditions of approval.* In granting any approval pursuant to Chapter 54, the city engineer may impose such conditions as may be reasonably necessary to prevent creation of a nuisance or unreasonable hazard to persons or to a public or private property. Such conditions shall include (even if not specifically written in the Plan), but need not be limited to the granting (or securing from others) and recordation in county land records of easements for drainage facilities, including the acceptance of their discharge on the property of others, and for the maintenance of facilities.

5. *Denial.* If the city engineer determines that the Storm Water Management Plan does not meet the requirements of Chapter 54, the Plan will not be approved. A revised Storm Water Management Plan must be resubmitted and approved before any land disturbing activity begins. All land use and building permits must be suspended until the applicant has an approved Storm Water Management Plan.

6. *Appeal.* Any affected party may appeal any Storm Water Management Plan decision by an issuing authority to the Planning Commission. Appeal of the issuing authority's decision shall follow the procedures established in the Minneapolis Zoning Code, Section 525.160. (99-Or-156, § 1, 11-24-99)

54.80. Responsibility during construction/completion. (a) *Duration.* The applicant shall fully perform and complete all of the work within one (1) year or as otherwise specified in the Plan and approved.

(b) *Renewals/extensions.* Prior to the end of the approved schedule, the applicant may present a written request for an extension to the city engineer. If, in the opinion of the city engineer, an extension is warranted, an extension may be granted not to exceed one (1) year.

(c) *Changes to plans.* Any modifications to an approved Storm Water Management Plan must be approved by the city engineer.

(d) *Conformity with the plan.* The applicant shall, at all times, be in conformity with the approved Storm Water Management Plan.

(e) *Construction/completion final report and certification.* The applicant shall submit a final report to the city engineer for certification of completion. (99-Or-156, § 1, 11-24-99)

54.90. Responsibility following construction/completion. (a) *Duration.* An approved storm water management plan shall remain in effect unless cancellation is approved by the city engineer. All site areas used for the purpose of flood storage or treatment of storm water runoff shall be preserved and maintained for that use, including areas required for maintenance and inspection.

(b) *Changes to plans.* A responsible party can request modifications to an approved storm water management plan, and the issuing authority can order modifications to an approved storm water management plan. Any modification to an approved storm water management plan must be approved by the city engineer.

(c) *Annual notification.* The assistant city coordinator of regulatory services shall annually notify responsible parties of storm water management devices of the need to register, that the devices are subject to annual inspection, and to conduct maintenance on a one (1) year interval or in accordance with maintenance plans on file.

(d) *Annual site registration.* Any person(s), organization, company, group, or any other entity, public or private, in control of storm water management devices installed under this ordinance or existing prior to this ordinance shall register that site annually with the assistant city coordinator of regulatory services, remit an annual registration fee at the rate as established in Appendix J, License Fees Schedule per storm water management device. Submission and payment confirm that the site's storm water management devices have been inspected, maintained and are functioning satisfactorily. The annual fee shall be due and payable on January 31st of each year. If registration is not received or postmarked on or before January 31st of each year, the applicant shall pay late fees provided for such registration. Failure to obtain the appropriate permit prior to discharging will result in a doubling of fees. Each day of failure to maintain or obtain registration may constitute a separate violation of this Code.

(e) *Annual inspection of storm water facilities.* All storm water management devices are subject to annual inspection by the assistant city coordinator of regulatory services. If the city engineer or assistant city coordinator of regulatory services deems that devices are not functioning satisfactorily, a notice of noncompliance may be issued and procedures followed as described in Section 54.90(f)(2).

(f) *Maintenance of storm water constructed facilities.*

(1) *Regular maintenance.* Regular maintenance of storm water management constructed facilities in accordance with the approved plan shall be required unless the plan is modified and approved by the city engineer ([section] 54.90(2)). All facilities shall be maintained in proper condition for sustained use, consistent with the performance standards for which they were originally designed.

a. All settled materials from ponds, sumps, grit chambers, and other devices, including settled solids, shall be removed and properly disposed of.
b. All planted materials integral to storm water facility performance, safety, and/or aesthetic quality shall be maintained in proper condition consistent with design performance standards, including replacement when necessary.
(2) *Action upon non-compliance.* In the event maintenance does not conform to the approved plan or to any instructions of the issuing authority, notice to comply shall be given to the responsible party in writing. After a notice to comply is given, in the determination of the issuing authority, the responsible party shall be required to make the corrections within the time period determined by the issuing authority. If an imminent hazard exists, the issuing authority may require that the corrective work begin immediately. Failure of the responsible party to comply with the directives of section 54.90(f)(1) will constitute a violation pursuant to section 54.90(f)(2), and the issuing authority may proceed with the necessary maintenance of the site at the expense of the responsible party. The responsible party will be billed for the expenses incurred by the issuing authority. Failure to pay will result in the issuing authority seeking recovery of costs and damages pursuant to the conditions set forth in section 54.120. (99-Or-156, § 1, 11-24-99; 2006-Or-052, § 2, 5-12-06; Ord. No. 2009-Or-019, § 1, 3-6-09)

54.100. Liability. The responsible party is responsible for safe and legal compliance with Chapter 54. Neither approval under the provisions of Chapter 54, nor the compliance with the provisions hereto or with any condition imposed by the issuing authority, shall relieve any person from responsibility for damage to persons or property resulting therefrom, or as otherwise imposed by law, nor impose any liability upon the city for damages to persons or property. (99-Or-156, § 1, 11-24-99)

54.110. Administration and enforcement. The issuing authority shall be responsible for the administration and enforcement of Chapter 54. Land use and building permits will not be issued until a Storm Water Management Plan has been approved. The issuing authority may post a stop work order if any land disturbing activity regulated under Chapter 54 is being undertaken without an approved Storm Water Management Plan or if any of the conditions of the Storm Water Management Plan are not being met. (99-Or-156, § 1, 11-24-99)

54.120. Penalties. Any person, firm, corporation or agency acting as property owner, responsible party, or otherwise, who fails to comply with the provisions of this Chapter 54 shall be guilty of a misdemeanor. (99-Or-156, § 1, 11-24-99)

54.130. Interpretation. In their interpretation and application, the provisions of this ordinance shall be held to be minimum requirements and shall be liberally construed in favor of the city and shall not be deemed a limitation or repeal of any other powers granted by state statutes. (99-Or-156, § 1, 11-24-99)

54.140. Severability. If any section, clause, provision or portion of this chapter is adjudged unconstitutional or invalid by a court of competent jurisdiction, the remainder of the chapter shall not be affected thereby. (99-Or-156, § 1, 11-24-99)

54.150. Disclaimer. This chapter does not imply that areas will be free from flooding or flood damages. This chapter does not create liability on the part of the city or its officers

or employees for any flood damage that may result from reliance on this chapter or any administrative decisions made under it. (99-Or-156, § 1, 11-24-99)

54.160. Abrogation and greater restrictions. It is not intended by this chapter to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this chapter imposes greater restrictions, the provisions of this chapter shall prevail. All other ordinances inconsistent with this ordinance are hereby repealed to the extent of the inconsistency only. (99-Or-156, § 1, 11-24-99)

54.170. Relation to other laws. Neither Chapter 54 nor any administrative decision made under it exempts the applicant or any other person from procuring other required permits or complying with the requirements and conditions of such permits, or limits the right of any person to maintain, at any time, any appropriate action, at law or in equity, for relief or damages against the applicant or any other person arising from activity regulated by Chapter 54. (99-Or-156, § 1, 11-24-99)

54.180. Effective date. This ordinance shall become effective on January 1, 2000. (99-Or-156, § 1, 11-24-99)

GENERAL PERMIT
AUTHORIZATION TO DISCHARGE
STORMWATER ASSOCIATED WITH CONSTRUCTION ACTIVITY
UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM/
STATE DISPOSAL SYSTEM PROGRAM

ISSUANCE DATE: August 1, 2013 **EXPIRATION DATE: August 1, 2018**

This permit is issued in compliance with the provisions of the Clean Water Act, as amended, (33 U.S.C. 1251 et seq.), 40 Code of Federal Regulations (CFR) 122, 123, 124,and 450 as amended; Minnesota Statute chapters 115 and 116, as amended, and Minn. R. chs. 7001, 7050, 7060 and 7090.

This permit regulates discharges associated with **stormwater** affected by **construction activity** to **waters of the state** of Minnesota. This permit covers the **stormwater** discharges identified in Part I.A. of this permit. The limitations on permit coverage are identified in Part I.B. of this permit.

Minn. R. 7090.2040 requires **owner(s)** of a **construction activity** to complete a **Stormwater Pollution Prevention Plan (SWPPP)** prior to submitting an application for this permit and prior to conducting any **construction activity**. No person shall commence **construction activity** covered by Part I.A. until permit coverage under this permit is effective or, if applicable, until the Minnesota Pollution Control Agency (MPCA) has issued an individual **National Pollutant Discharge Elimination System (NPDES)**/State Disposal System (SDS) Construction **Stormwater** (CSW) Permit for the **project**.

Unless notified by the MPCA to the contrary, applicants who submit a complete and accurate application (including permit fee) in accordance with the requirements of this permit are authorized to discharge **stormwater** associated with construction activity under the terms and conditions of this permit as described in Part II.B.

Signature: _____

John Linc Stine
Commissioner

If you have questions on this permit, including the specific permit requirements, permit reporting or permit compliance status, please contact the appropriate MPCA offices. Note that **bolded** words throughout the permit are defined in Appendix B.

Minnesota Pollution Control Agency
Municipal Division
Construction Stormwater Program
520 Lafayette Road North
St. Paul, MN 55155-4194
Telephone: 651-296-6300
Toll free in MN: 800-657-3864

TABLE OF CONTENTS

Page

I. PERMIT COVERAGE AND LIMITATIONS 3

A. Permit Coverage 3
B. Limitations of Coverage 3

II. SUBMITTING THE APPLICATION 4

A. Prerequisite for Submitting a Permit Application 4
B. Application and Duration of Coverage 5
C. Termination of Coverage 6

III. STORMWATER DISCHARGE DESIGN REQUIREMENTS 7

A. Stormwater Pollution Prevention Plan Content 7
B. SWPPP Amendments 10
C. Temporary Sediment Basins 11
D. Permanent Stormwater Management System 12
E. Record Retention 15
F. Training Requirements 16

IV. CONSTRUCTION ACTIVITY REQUIREMENTS 16

A. Stormwater Pollution Prevention Plan 16
B. Erosion Prevention Practices 17
C. Sediment Control Practices 18
D. Dewatering and Basin Draining 20
E. Inspections and Maintenance 20
F. Pollution Prevention Management Measures 22
G. Final Stabilization 24

V. GENERAL PROVISIONS 24

A. Applicability Criteria 24
B. Record Availability 25
C. Prohibitions 25
D. Transfer of Ownership or Control 25
E. Civil and Criminal Liability 25
F. Severability 25
G. NPDES/SDS Rule Standard General -Conditions 26
H. Inspection and Entry 26

APPENDIX A 26

APPENDIX B - DEFINITIONS 31

PART I. PERMIT COVERAGE AND LIMITATIONS

I.A. PERMIT COVERAGE

1. This permit is required for **construction activity** that results in land disturbance of equal to or greater than one acre or a **common plan of development or sale** that disturbs greater than one acre, and authorizes, subject to the terms and conditions of this permit, the discharge of **stormwater** associated with **construction activity.**

   Construction activity does not include a disturbance to the land of less than five (5) acres for the purpose of routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of the facility. Pavement rehabilitation that does not disturb the underlying soils (e.g., mill and overlay **projects**) is not considered construction activity.

2. This permit covers all areas of the State of Minnesota.

3. Coverage under this permit is not required when all stormwater from **construction activity** is routed directly to and treated by a "treatment works", as defined in Minn. Stat. § 115.01, subd. 21, that is operated under an individual **NPDES**/SDS permit with a Total Suspended Solids effluent limit for all treated runoff.

4. Previously Permitted Ongoing **Projects: Permittee(s)** of ongoing **projects** covered initially under the previous MPCA-issued **NPDES**/SDS Construction Stormwater General Permit (issuance date August 1, 2008) are granted coverage under this reissued permit.

   a. The **Permittee(s)** of those ongoing **projects** shall amend the **SWPPP** for the **project** to meet the requirements of this reissued permit no later than 18 months after the issuance date of this reissued permit if the termination-of-coverage requirements in Part II.C. will not be met within 18 months of the issuance date of this reissued permit and shall thereafter comply with this permit. However, additional permanent treatment required in this reissued permit is not required for previously permitted **projects**.

   b. If the previously permitted ongoing **project** will meet the termination-of-coverage requirements in Part II.C. within 18 months of the issuance date of this reissued permit, the **Permittee(s)** shall comply with the 2008 construction general permit until the **project** is complete and a **Notice of Termination (NOT)** consistent with Part II.C. of this reissued permit is submitted.

   c. If a previously permitted ongoing **project** will not be able to meet the terms and conditions of this reissued permit (other than the additional permanent treatment requirement) and will continue longer than 18 months after the issuance date of this permit, the **Permittee(s)** shall apply for an individual permit in accordance with Minn. R. ch. 7001.

I.B. LIMITATIONS OF COVERAGE

This permit does not authorize discharges related to the following activities:

1. Discharges or releases that are not **stormwater** (except those non-**stormwater** discharges

authorized under Part IV.D.).

2. The placement of fill into **waters of the state** requiring local, state or federal authorizations (such as U.S. Army Corps of Engineers Section 404 permits, Minnesota Department of Natural Resources Public Waters Work Permits or Local Governmental Unit Wetland Conservation Act replacement plans or determinations).

3. Discharges associated with industrial activity except for **construction activity**. Discharges associated with industrial activity may need to obtain coverage under a separate NPDES/SDS permit once day-to-day operational activities commence even if construction is ongoing.

4. Discharges from non-point source agricultural and silvicultural activities excluded from **NPDES** permit requirements under 40 CFR pt. 122.3(e).

5. Discharges to the waters identified below unless the requirements of Appendix A are complied with:

   a. Discharges into outstanding resource value waters as listed in Minn. R. 7050.0180, subp. 3, 4, 5, 6, 6a and 6b.

   b. Discharges into trout waters as listed in Minn. R. 6264.0050, subp. 2 and 4.

   c. Discharges into **wetlands** as defined in Minn. R. 7050.0186 subd.1a.B.

   d. Discharges from **projects** that have not completed applicable Environmental Review requirements under state or federal laws.

   e. Discharges that adversely impact or contribute to adverse impacts on a state or federally listed endangered or threatened species or adversely modify a designated critical habitat.

   f. Discharges that adversely affect properties listed or eligible for listing in the National Register of Historic Places or affecting known or discovered archeological sites.

6. Discharges to waters identified as impaired pursuant to section 303(d) of the federal Clean Water Act (33 U.S.C. § 303(d)) where the identified pollutant(s) or stressor(s) are phosphorus (nutrient eutrophication biological indicators), turbidity, dissolved oxygen, or biotic impairment (fish bioassessment, aquatic plant bioassessment and aquatic macroinvertebrate bioassessment), and with or without a U.S. Environmental Protection Agency (USEPA) approved Total Maximum Daily Load (TMDL) for any of these identified pollutant(s) or stressor(s), unless the applicable requirements of Part III.A.8. are met.

PART II. SUBMITTING THE APPLICATION

II.A. PREREQUISITE FOR SUBMITTING A PERMIT APPLICATION

The **owner** must develop an accurate and complete **SWPPP** in accordance with Part III. (Stormwater Discharge Design Requirements) of this permit prior to submitting the application for coverage. The **SWPPP** is not required to be submitted to the MPCA (unless the **project** size is 50 acres or more and will discharge to certain waters as described in Part II.B.1.b.) but is to be retained by the **owner** in

accordance with Part III.E. (Record Retention). The **owner's** failure to prepare an accurate and complete **SWPPP** prior to submitting the application is grounds for MPCA to revoke the permit.

II.B. APPLICATION AND DURATION OF COVERAGE

1. Application Required.

   a. The **owner** and **operator** shall submit a complete and accurate on-line application form with the appropriate fee to the MPCA for each **project** that disturbs one (1) or more acres of land or for a **common plan of development or sale** that will ultimately disturb one (1) or more acres. If the applicant is not able to apply on-line, contact the MPCA for technical assistance or a waiver.

   b. For certain **projects** or **common plans of development or sale** disturbing 50 acres or more, the application must be submitted at least 30 days before the start of **construction activity**. This requirement pertains to **projects** that have a discharge point on the **project** that is within one mile (**aerial radius measurement**) of, and flows to, a special water listed in Appendix A, Part B. or waters listed as impaired under section 303(d) of the federal Clean Water Act (see the MPCA's website) where the identified pollutant(s) or stressor(s) are phosphorus (nutrient eutrophication biological indicators), turbidity, dissolved oxygen, or biotic impairment (fish bioassessment, aquatic plant bioassessment and aquatic macroinvertebrate bioassessment). Applicants of **projects** listed in this part must submit a complete and accurate application form and **SWPPP** including all calculations for the Permanent **Stormwater** Management System (see Parts III.A.-D.).

2. All persons meeting the definition of **owner** and **operator** are **Permittees** and must be listed on the application. The **owner** is responsible for compliance with all terms and conditions of this permit. The **operator** is responsible for compliance with Parts II.B, II.C, III.B-F, IV, V, and applicable **construction activity** requirements found in Appendix A, Part C. of this permit and is jointly responsible with the **owner** for compliance with those portions of the permit.

3. Permit Coverage Effective Date: The commencement of any **construction activity** (e.g., land disturbing activities) covered under Part I.A. of this permit is prohibited until permit coverage under this permit is effective.

   a. For **projects** listed in Part II.B.1.a. permit coverage will become effective <u>seven (7) calendar days</u> after the electronic submittal date or the postmarked date of a complete application form.

   b. For **projects** listed in Part II.B.1.b. permit coverage will become effective 30 calendar days after the electronic submittal date, the postmarked date or MPCA date stamp (whichever is first) of the complete application. For incomplete applications (e.g., lack of fees or signature) or incomplete **SWPPPs** (e.g., missing calculations, **Best Management Practice (BMP)** specifications, estimated quantities of the **BMPs,** or timing of **BMP** installation narrative), the permit becomes effective 30 calendar days after all required information is submitted.

4. Coverage Notification: **Permittee(s)** will be notified of coverage in a manner as determined by the **Commissioner** (e.g., e-mail, online notification or letter).

5. Change of Coverage: For construction **projects** where the **owner** or **operator** changes, (e.g., an original developer sells portions of the property to various homebuilders or sells the entire site to a new **owner**) the current **owner** and the new **owner** or **operato**r shall submit a complete permit modification on a form provided by the **Commissioner**. The form must be submitted prior to the new **owne**r or **operator** commencing **construction activity** on site or in no case later than 30 days after taking ownership of the property. The **owner** shall provide a **SWPPP** to the new **owner** and **operator** that specifically addresses the remaining **construction activity**.

II.C. TERMINATION OF COVERAGE

1. Termination of coverage when construction is complete: All **Permittee(s)** must submit a **Notice of Termination (NOT)** to the MPCA on a form provided by the **Commissioner** within 30 days after all activities required for **Final Stabilization** (see Part IV.G.) are complete. The **Permittee(s)'** coverage under this permit terminates at midnight on the submission date of the **NOT**.

2. Termination of coverage when transfer of ownership occurs: All **Permittee(s)** must submit a **NOT** on a form provided by the **Commissioner** within 30 days after selling or otherwise legally transferring the entire site, including permit responsibility for roads (e.g., street sweeping) and **stormwater** infrastructure final clean out, or transferring portions of a site to another party. The **Permittee(s)'** coverage under this permit terminates at midnight on the submission date of the **NOT**.

3. **Permittee(s)** may terminate permit coverage prior to completion of all **construction activity** if all of the following conditions are met. After the permit is terminated under this Part, if there is any subsequent development on the remaining portions of the site where **construction activity** was not complete, new permit coverage must be obtained if the subsequent development itself or as part of the remaining **common plan of development or sale** will result in land disturbing activities of one (1) or more acres in size.

   a. **Construction activity** has ceased for at least 90 days.

   b. At least 90 percent (by area) of all originally proposed **construction activity** has been completed and **permanent cover** established on those areas.

   c. On areas where **construction activity** is not complete, **permanent cover** has been established.

   d. The site is in compliance with Part IV.G.2. and Part IV.G.3. and where applicable, Part IV.G.4. or Part IV.G.5.

4. **Permittee(s)** may terminate coverage upon approval by the MPCA if information is submitted to the MPCA documenting that termination is appropriate because the project is cancelled.

PART III. STORMWATER DISCHARGE DESIGN REQUIREMENTS

III.A. STORMWATER POLLUTION PREVENTION PLAN CONTENT

The **owner** must develop a **Stormwater Pollution Prevention Plan** (**SWPPP).** The **SWPPP** shall be

completed prior to submitting any permit application and prior to conducting any **construction activity** by any required **Permittee(s)**. For **stormwater** discharges from **construction activity** where the **owner** or **operator** changes, the new **owner** or **operator** can implement the original **SWPPP** created for the **project**, modify the original **SWPPP**, or develop and implement their own **SWPPP**. **Permittee(s)** shall ensure either directly or through coordination with other **Permittee(s)** that their **SWPPP** meets all terms and conditions of this permit and that their activities do not render another party's **erosion prevention** and **sediment control BMPs** ineffective. The **SWPPP** must include the following:

1. A description of the **construction activity:** The description must be a combination of narrative, plan sheets, and (if appropriate) standard detail sheets that address the foreseeable conditions, at any stage in the construction or post construction activities. The **SWPPP** must identify the potential for discharge of sediment and/or other potential pollutants from the site. The **SWPPP** must propose **erosion prevention and sediment control BMPs** to control the discharge of sediment and/or other potential pollutants from the site.

2. Knowledgeable person/chain of responsibility: As part of the **SWPPP,** the **owner** must identify a person knowledgeable and experienced in the application of **erosion prevention** and **sediment control BMPs** who will oversee the implementation of the **SWPPP**, and the installation, inspection and maintenance of the **erosion prevention** and **sediment control BMPs** (see Part III.F.1.) before and during construction. The **owner** must identify in the **SWPPP** who will have the responsibility for long-term operation and maintenance of the Permanent **Stormwater** Management System (see Part III.D.). The **owner** shall include in the **SWPPP** a chain of responsibility with all **operators** on the site, or if not known, the title or position of the responsible party, to ensure that the **SWPPP** will be implemented and stay in effect until the construction **project** is complete, the entire site has undergone **Final Stabilization**, and an **NOT** has been submitted to the MPCA. Once the identity of the responsible party is known, the SWPPP must be amended to include this information.

3. Training documentation: The **Permittee(s)** shall ensure the individuals identified in Part III.F. have been trained in accordance with this Permit's training requirements. The **Permittee(s)** shall ensure the training is recorded in or with the **SWPPP** before the start of construction or as soon as the personnel for the **project** have been determined. Documentation shall include:

    a. Names of the personnel associated with this **project** that are required to be trained per Part III.F.1. of this permit.

    b. Dates of training and name of instructor(s) and entity providing training.

    c. Content of training course or workshop including the number of hours of training.

4. Designs, calculations, and narrative: The **SWPPP** must incorporate the requirements of Part III (**Stormwater** Discharge Design Requirements) including calculations, Part IV (**Construction Activity** Requirements) and Appendix A for the **project**. A narrative describing the timing for installation of all **erosion prevention** and **sediment control BMPs** and permanent **stormwater** management systems required in Part III, Part IV and Appendix A must also be included in the **SWPPP**.

5. **SWPPP** components: The **SWPPP** requirements must be incorporated into the **project's** final

plans and specifications and/or **project** documentation, as appropriate, and must include:

a. Location and type of all temporary and permanent **erosion prevention** and **sediment control BMPs** along with procedures to be used to establish additional temporary **BMPs** as necessary for the site conditions during construction. **Standard details** and/or specifications for the **BMPs** used on the **project** must be included in the final plans and specifications for the **project**.

b. Quantities: Estimated preliminary quantities tabulation anticipated at the start of the **project** for the life of the **project** must be included for all **erosion prevention** and **sediment control BMPs** in the **SWPPP** (e.g., linear feet of silt fence or ft^2 of erosion control blanket).

c. Impervious surface: The number of acres of **impervious surface** for both pre- and post-construction must be specified.

d. Site map: A site map with existing and final grades, including dividing lines and direction of flow for all pre-and post-construction **stormwater** runoff drainage areas located within the **project** limits must be included. The site map must indicate the areas of **steep slopes**. The site map must also include **impervious surfaces,** soil types and locations of potential pollutant-generating activities as identified in Part IV.F.

e. Locations of areas not to be disturbed: Buffer zones, as required for temporary **BMPs** during construction in Part IV.C.9., or if required as permanent **BMPs** in Appendix A, Part C.3., must be described and identified on plan sheets or **project** maps in the **SWPPP**.

f. Construction phasing: Location of areas where construction will be phased to minimize duration of exposed soil areas must be described.

g. Maps of surface waters and wetlands: The **SWPPP** must include a map of all **surface waters,** existing **wetlands**, and **stormwater** ponds or basins which can be identified on maps such as United States Geological Survey 7.5 minute quadrangle maps, the National Wetland Inventory map or equivalent maps within one mile (**aerial radius measurement**) from the **project** boundaries that will receive **stormwater** from the construction site, during or after construction. Where **surface waters** receiving **stormwater** associated with **construction activity** will not fit on the plan sheet, they must be identified with an arrow, indicating both direction and distance to the **surface water**. The **SWPPP** must identify if the **surface water** is a special or impaired water. The site map must also show **construction activity** areas that are adjacent to and drain to **Public Waters** for which the Department of Natural Resources has promulgated “work in water restrictions” during specified fish spawning time frames.

h. **Final stabilization:** Methods to be used for **Final Stabilization** of all exposed soil areas must be described.

i. **BMP** design factors: The **SWPPP** must account for the following factors in designing the temporary **erosion prevention** and **sediment control BMPs**:

    i. The expected amount, frequency, intensity, and duration of precipitation.

    ii. The nature of **stormwater** runoff and run-on at the site, including factors such as

expected flow from **impervious surface**s, slopes, and site drainage features.

iii. If any **stormwater** flow will be channelized at the site, the **Permitte(s)** must design **BMPs** to control both peak flowrates and total **stormwater** volume to minimize erosion at outlets and to minimize downstream channel and streambank erosion.

iv. The range of soil particle sizes expected to be present on the site.

j. Soil Management: Methods used to minimize soil compaction and preserve topsoil must be described. Minimizing soil compaction is not required where the function of a specific area of the site dictates that it be compacted.

k. Maintenance plan: For **projects** that include permanent **stormwater** treatment systems, the **SWPPP** must include a maintenance plan identifying who will be performing future maintenance of the system.

l. Chemical treatments: Any specific chemicals and the chemical treatment systems that may be used for enhancing the sedimentation process on the site, and how compliance will be achieved with the requirements in Part IV.C.10., must be described.

m. Documentation of **infeasibility**: If the **Permittee(s)** determine(s) that compliance with the requirement for temporary sediment basins (Part III.C.) is **infeasible** on the **project** site; the **Permittee(s)** must document that determination and the substitute **BMPs** in the **SWPPP**. If **Permittee(s)** cannot obtain right-of-way for the permanent stormwater management system; the **Permittee(s)** must document the infeasibility of obtaining right-of-way (Part III.D.)

6. Stormwater pollution mitigation measures identified in environmental review or other required review: The **SWPPP** must include any **stormwater** mitigation measures approved as part of a final environmental review document, endangered species review, archeological or other required local, state or federal review conducted for the **project**. For the purposes of this permit provision, mitigation measures means actions necessary to avoid, minimize, or rectify (e.g., repairing, rehabilitating, restoring), reducing, eliminating or compensating for impacts related to: (1) **stormwater** discharges associated with the **project's construction activity**; and (2) **erosion prevention**, **sediment control** and the Permanent **Stormwater** Management System for the **project**.

7. Karst areas: The **SWPPP** must identify additional or different measures necessary (e.g. impervious liner in pond bottom) to assure compliance with **surface and groundwater** standards in Minn. R. chs. 7050 and 7060 in karst areas and to ensure protection of drinking water supply management areas (see Minn. R. 4720.5100, subp. 13).

8. Impaired Waters and Total Maximum Daily Loads (TMDLs): The **SWPPP** must address the following:

   a. For **projects** that have a discharge point on the **project** that is within one mile (**aerial radius measurement**) of and which flows to an impaired water, the **Permittee(s)** must identify the impaired water(s) in the **SWPPP**, and whether or not there is a USEPA-approved TMDL for the pollutant(s) or stressor(s) identified in Appendix A, Part B.10. Unless otherwise notified by the MPCA in writing, the **Permittee(s)'** identification of impaired waters must be based

on the most recent USEPA approved section 303(d) Clean Water Act list of impaired waters and USEPA approved TMDLs at the time a complete permit application is submitted. The **Permittee(s)'** identification must include those TMDLs, applicable to the **project's stormwater** discharge, that were approved at any time prior to permit application submittal and are still in effect.

b. If the TMDL identifies specific implementation activities regarding construction **stormwater** that would apply to the site discharges, the **Permittee(s)** must include the **BMPs** identified in the TMDL and any other specific construction **stormwater** related implementation activities identified in the TMDL.

III.B. SWPPP AMENDMENTS

The **Permittee(s)** must amend the **SWPPP** as necessary to include additional requirements, such as additional or modified **BMPs** that are designed to correct problems identified or address situations whenever:

1. There is a change in design, construction, operation, maintenance, weather or seasonal conditions that has a significant effect on the discharge of pollutants to **surface waters** or **underground waters**.

2. Inspections or investigations by site **owner** or **operators**, USEPA or MPCA officials indicate the **SWPPP** is not effective in eliminating or significantly minimizing the discharge of pollutants to **surface waters** or **underground waters** or that the discharges are causing water quality standard exceedances (e.g., nuisance conditions as defined in Minn. R. 7050.0210, subp. 2).

3. The **SWPPP** is not achieving the general objectives of minimizing pollutants in **stormwater** discharges associated with **construction activity**, or the **SWPPP** is not consistent with the terms and conditions of this permit.

4. At any time after permit coverage is effective, the MPCA may determine that the **project's stormwater** discharges may cause, have reasonable potential to cause, or contribute to non-attainment of any applicable water quality standard, or that the **SWPPP** does not incorporate the applicable requirements in Part III.A.8., (Impaired Waters and TMDLs). If a water quality standard changes during the term of this permit, the MPCA will make a determination as to whether a modification of the SWPPP is necessary to address the new standard. If the MPCA makes such determination(s) or any of the determinations in Parts III.B.1.-3., the MPCA will notify the **Permittee(s)** in writing. In response, the **Permittee(s)** must amend the **SWPPP** to address the identified concerns and submit information requested by the MPCA, which may include an individual permit application. If the MPCA's written notification requires a response, failure to respond within the specified timeframe constitutes a permit violation.

III.C. TEMPORARY SEDIMENT BASINS

Where ten (10) or more acres of disturbed soil drain to a common location, the **Permittee(s)** must provide a temporary sediment basin to provide treatment to the runoff before it leaves the construction site or enters **surface waters**. A temporary sediment basin may be converted to a permanent basin after construction is complete. The temporary basin is no longer required when

permanent cover has reduced the acreage of disturbed soil to less than ten (10) acres draining to a common location. The **Permittee(s)** is/are encouraged, but not required, to install temporary sediment basins where appropriate in areas with **steep slopes** or highly erodible soils even if less than ten (10) acres drains to one area. The basins must be designed and constructed according to the following requirements:

1. The basins must provide live storage for a calculated volume of runoff from a two (2)-year, 24-hour storm from each acre drained to the basin, except that in no case shall the basin provide less than 1,800 cubic feet of live storage from each acre drained to the basin.

2. Where the calculation in Part III.C.1. has not been performed, a temporary sediment basin providing 3,600 cubic feet of live storage per acre drained to the basin shall be provided for the entire drainage area of the temporary basin.

3. Temporary basin outlets must be designed to prevent short-circuiting and the discharge of floating debris. The basin must be designed with the ability to allow complete basin drawdown for maintenance activities, and must include a **stabilized** emergency overflow to prevent failure of pond integrity. The outlet structure must be designed to withdraw water from the surface in order to minimize the discharge of pollutants, except that the use of a surface withdrawal mechanism for discharge of the basin may be temporarily suspended during frozen conditions. **Energy dissipation** must be provided for the basin outlet (see Part IV.B.5.).

4. Sediment Basins must be situated outside of surface waters and any buffer zone required under Appendix A.C.3, and must be designed to avoid draining water from **wetlands** unless the impact to the **wetland** is in compliance with the requirements of Appendix A, Part D.

5. The temporary basins must be constructed and made operational prior to 10 or more acres of disturbed soil draining to a common location.

6. Where a temporary sediment basin meeting the requirements of this part is **infeasible**, equivalent **sediment controls** such as smaller sediment basins, and/or sediment traps, silt fences, vegetative buffer strips, or any appropriate combination of measures are required for all down-slope boundaries of the construction area and for side-slope boundaries as dictated by individual site conditions. In determining whether installing a sediment basin is **infeasible**, the **Permittee(s)** must consider public safety and may consider factors such as site soils, slope, and available area on site. This determination of **infeasibility** must be documented in the **SWPPP** per Part III.A.5.m.

III.D. PERMANENT STORMWATER MANAGEMENT SYSTEM

The **Permittee(s)** shall design the **project** so that all **stormwater** discharged from the **project** during and after **construction activities** does not cause a violation of state water quality standards, including nuisance conditions, erosion in receiving channels or on downslope properties, or a significant adverse impact to **wetlands** caused by inundation or decrease of flow.

The **Permittee(s)** shall construct a permanent stormwater management system meeting the requirements of this Part, or if the **project** is located in a jurisdiction subject to a **NPDES/**SDS Municipal Separate Storm Sewer System (MS4) permit and that permit has established permanent treatment requirements that include volume reduction, the **Permittee(s)** can comply with the

permanent treatment requirements established under the MS4 permit in lieu of the permanent treatment requirements of this permit.

Where a **project's** ultimate development replaces vegetation and/or other pervious surfaces with one (1) or more acres of cumulative **impervious surface**, the **Permittee(s)** must design the **project** so that the **water quality volume** of one (1) inch of runoff from the new **impervious surfaces** created by the **project** is retained on site (i.e. infiltration or other volume reduction practices) and not discharged to a **surface water**. For purposes of this part, **surface waters** does not include man-made drainage systems that convey **stormwater** to a compliant permanent **stormwater** management system.

For those **projects** where infiltration is prohibited (see Part III.D.1.j.), the **Permittee(s)** shall consider other methods of volume reduction and the **water quality volume** (or remainder of the **water quality volume** if some volume reduction is achieved) must be treated by a wet sedimentation basin, filtration system, regional ponding or equivalent methods prior to the discharge of **stormwater** to **surface waters**.

Where the proximity to bedrock precludes the installation of any of the permanent **stormwater** management practices outlined in Part III.D., other treatment, such as grassed swales, filtration systems, smaller ponds, or grit chambers, is required prior to the discharge of **stormwater** to **surface waters**.

For work on linear **projects** with lack of right-of-way where the **Permittee(s)** cannot obtain an easement or other permission for property needed to install treatment systems capable of treating the entire **water quality volume** on site, the **Permittee(s)** must maximize the **water quality volume** that can be treated prior to discharge to **surface waters**. Treatment can be provided through other methods or combination of methods such as grassed swales, filtration systems, smaller ponds, or grit chambers, prior to discharge to **surface waters**. A reasonable attempt must be made to obtain right-of-way during the **project** planning process. Documentation of these attempts must be in the **SWPPP** per Part III.A.5.m. in the section addressing **infeasibility**.

When constructing any of the permanent **stormwater** management systems in this part, the **Permittee(s)** must incorporate the following design parameters:

1. Infiltration/Filtration

    a. Infiltration/Filtration options include but are not limited to: infiltration basins, infiltration trenches, rainwater gardens, sand filters, organic filters, bioretention areas, natural or enhanced swales, dry storage ponds with underdrain discharge, off-line retention areas, and natural depressions. Infiltration must be used only as appropriate to the site and land uses. The method selected by the **Permittee(s)** must remove settleable solids, floating materials, and oils and grease from the runoff to the maximum extent practicable before runoff enters the infiltration/filtration system. Filtration systems must be designed to remove at least 80 percent of total suspended solids. When designing the system the **Permittee(s)** must evaluate the impact of constructing an infiltration practice on existing hydrologic features (e.g., existing **wetlands**) and the system must be designed to maintain pre-existing conditions (e.g., do not breach a perched water table that is supporting a **wetland**). For a discussion of potential **stormwater** hotspots, groundwater warnings, design measures, maintenance considerations or other retention, detention, and treatment devices, see the

Minnesota Stormwater Manual found on the MPCA's website.

b. Infiltration systems must not be excavated to final grade until the contributing drainage area has been constructed and fully **stabilized** unless rigorous erosion prevention and sediment controls are provided (Part III.D.1.c.).

c. When an infiltration system is excavated to final grade (or within three (3) feet of final grade), the **Permittee(s)** must employ rigorous **erosion prevention** and **sediment controls** (e.g., diversion berms) to keep sediment and runoff completely away from the infiltration area. The area must be staked off and marked so that heavy construction vehicles or equipment will not compact the soil in the proposed infiltration area.

d. To prevent clogging of the infiltration or filtration system, the **Permittee(s)** must use a pretreatment device such as a vegetated filter strip, small sedimentation basin, or water quality inlet (e.g., grit chamber) to settle particulates before the **stormwater** discharges into the infiltration or filtration system.

e. The **Permittee(s)** must design infiltration or filtration systems that provide a **water quality volume** (calculated as an instantaneous volume) of one (1) inch of runoff (or one (1) inch minus the volume of **stormwater** treated by another system on the site) from the new impervious surfaces created by the **project**.

f. The **Permittee(s)** must design the infiltration/filtration system to discharge the **water quality volume** routed to the system through the soil surface or filter media within 48 hours or less. Additional flows that cannot be infiltrated or filtered within 48 hours must be routed to bypass the system through a **stabilized** discharge point. The **Permittee(s)** must design the infiltration system to provide a means to visually verify that the system is discharging through the soil surface or filter media within 48 hours or less.

g. The **Permittee(s)** shall employ appropriate on-site testing consistent with the recommendations found in the **Minnesota Stormwater Manual** to verify soil type and to ensure a minimum of three (3) feet of separation from the seasonally **saturated soils** (or from bedrock) and the bottom of the proposed infiltration/filtration system.

h. The **Permittee(s)** must ensure filtration systems with less than three (3) feet of separation from seasonally **saturated soils** or from bedrock are constructed with an impermeable liner.

i. The **Permittee(s)** must design adequate maintenance access (typically eight (8) feet wide).

j. Infiltration is prohibited when the infiltration system will be constructed in:

   i. Areas that receive discharges from vehicle fueling and maintenance.

   ii. Areas with less than three (3) feet of separation distance from the bottom of the infiltration system to the elevation of the seasonally **saturated soils** or the top of bedrock.

iii. Areas that receive discharges from industrial facilities which are not authorized to infiltrate industrial **stormwater** under an **NPDES/**SDS Industrial Stormwater Permit issued by the MPCA.

iv. Areas where high levels of contaminants in soil or groundwater will be mobilized by the infiltrating **stormwater.**

v. Areas of predominately Hydrologic Soil Group D (clay) soils unless allowed by a local unit of government with a current MS4 permit.

vi. Areas within 1,000 feet up-gradient, or 100 feet down-gradient of active karst features unless allowed by a local unit of government with a current MS4 permit.

vii. Areas within a Drinking Water Supply Management Area (DWSMA) as defined in Minn. R. 4720.5100, subp. 13., unless allowed by a local unit of government with a current MS4 permit.

viii. Areas where soil infiltration rates are more than 8.3 inches per hour unless soils are amended to slow the infiltration rate below 8.3 inches per hour or as allowed by a local unit of government with a current MS4 permit.

2. Wet Sedimentation Basin

a. The **Permitte(s)** must design the basin to have a permanent volume of 1,800 cubic feet of storage below the outlet pipe for each acre that drains to the basin. The basin's permanent volume must reach a minimum depth of at least three (3) feet and must have no depth greater than 10 feet. The basin must be configured such that scour or resuspension of solids is minimized.

b. The **Permittee(s)** must design basins to provide live storage for a **water quality volume** (calculated as an instantaneous volume) of one (1) inch of runoff (or one (1) inch minus the volume of **stormwater** treated by another system on the site) from the new impervious surfaces created by the **project**.

c. The **Permittee(s)** must design basin outlets such that the **water quality volume** is discharged at no more than 5.66 cubic feet per second (cfs) per acre of surface area of the pond.

d. The **Permittee(s)** must design basin outlets to prevent short-circuiting and the discharge of floating debris. Basin outlets must have **energy dissipation**.

e. The **Permittee(s)** must design the basin to include a **stabilized** emergency overflow to accommodate storm events in excess of the basin's hydraulic design.

f. The **Permittee(s)** must design adequate maintenance access (typically eight (8) feet wide).

g. The **Permittee(s)** must design sediment Basins to be situated outside of **surface waters** and any buffer zone required under Appendix A, Part C.3. and they must be designed to avoid draining water from **wetlands** unless the impact to the **wetland** is in compliance with the requirements of Appendix A, Part D.

3. Regional Ponds

   When the entire **water quality volume** cannot be retained onsite, the **Permittee(s)** can use or create regional ponds provided that they are constructed ponds, not a natural **wetland** or water body, (**wetlands** used as regional ponds must be mitigated for, see Appendix A, Part D) and designed in accordance with this permit's design requirements (Part III.D.2.) for all water from **impervious surfaces** that reach the pond. **Permittee(s)** shall not construct regional ponds in **wetlands**, regardless of their condition, quality or designation by local plans, unless the mitigative sequence in Appendix A, Part D. of this permit has been completed. There must be no significant degradation of the waterways between the **project** and the regional pond. The **owner** must obtain written authorization from the applicable local governmental unit (LGU) or private entity that owns and maintains the regional pond. The LGU's or private entity's written authorization must identify that the regional pond will discharge the **water quality volume** (one (1) inch of runoff from the impervious watershed area) at no more than 5.66 cfs per acre of surface area of the pond. The **owner** must include the LGU's or private entities' written authorization in the **SWPPP**. The LGU's or private entity's written authorization must be obtained before the **owner** finalizes the **SWPPP** and before any application for this permit is made to the MPCA.

III.E RECORD RETENTION

The **SWPPP** (original or copies) including, all changes to it, and inspections and maintenance records must be kept at the site during construction by the **Permittee(s)** who has/have operational control of that portion of the site. The **SWPPP** can be kept in either the field office or in an on-site vehicle during normal working hours.

All **owner(s)** must keep the following records on file for three (3) years after submittal of the **NOT** as outlined in Part II.C. This does not include any records after submittal of the **NOT**.

1. The final SWPPP

2. Any other **stormwater** related permits required for the **project**

3. Records of all inspection and maintenance conducted during construction (Part IV.E. Inspections and Maintenance)

4. All permanent operation and maintenance agreements that have been implemented, including all right-of-way, contracts, covenants and other binding requirements regarding perpetual maintenance and

5. All required calculations for design of the temporary and permanent **Stormwater** Management Systems.

III.F. TRAINING REQUIREMENTS

The **Permittee(s)** shall ensure the following individuals identified in this part have been trained in accordance with this Permit's training requirements.

1. Who must be trained:

   a. Individual(s) preparing the **SWPPP** for the **project**

   b. Individual(s) overseeing implementation of, revising, and amending the **SWPPP** and individual(s) performing inspections as required in Part IV.E. One of these individual(s) must be available for an onsite inspection within 72 hours upon request by the MPCA.

   c. Individual(s) performing or supervising the installation, maintenance and repair of **BMPs**. At least one individual on a **project** must be trained in these job duties.

2. Training content: The content and extent of training must be commensurate with the individual's job duties and responsibilities with regard to activities covered under this permit for the **project**. At least one individual present on the permitted **project** site (or available to the **project** site in 72 hours) must be trained in the job duties described in Part III.F.1.b. and Part III.F.1.c.

3. The **Permittee(s)** shall ensure that the individuals are trained by local, state, federal agencies, professional organizations, or other entities with expertise in **erosion prevention**, **sediment control,** permanent **stormwater** management and the Minnesota **NPDES**/SDS Construction Stormwater Permit. An update refresher-training must be attended every three (3) years starting three (3) years from the issuance date of this permit.

PART IV. CONSTRUCTION ACTIVITY REQUIREMENTS

IV.A. STORMWATER POLLUTION PREVENTION PLAN

The **Permittee(s)** must implement the **SWPPP** and the requirements of this part. The **BMPs** identified in the **SWPPP** and in this permit must be selected, installed, and maintained in an appropriate and functional manner that is in accordance with relevant manufacturer specifications and accepted engineering practices.

IV.B. EROSION PREVENTION PRACTICES

1. The **Permittee(s)** must plan for and implement appropriate **BMPs** such as construction phasing, vegetative buffer strips, horizontal slope grading, inspection and maintenance of Part IV.E. and other construction practices that minimize erosion as necessary to comply with this permit and protect **waters of the state**. The location of areas not to be disturbed must be delineated (e.g., with flags, stakes, signs, silt fence etc.) on the **project** site before work begins. The **Permittee(s)** must minimize the need for disturbance of portions of the **project** that have **steep slopes**. For those sloped areas which must be disturbed, the **Permittee(s)** must use techniques such as phasing and **stabilization** practices designed for **steep slopes** (e.g., slope draining and terracing).

2. The **Permittee(s)** must **stabilize** all exposed soil areas (including stockpiles). **Stabilization** must be **initiated immediately** to limit soil erosion whenever any **construction activity** has permanently or temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days. **Stabilization** must be completed no later than 14 calendar days after the **construction activity** in that portion of the site has temporarily or permanently ceased. For **Public Waters** that the Minnesota Department of Natural Resources has promulgated "work

in water restrictions" during specified fish spawning time frames, all exposed soil areas that are within 200 feet of the water's edge, and drain to these waters must complete the **stabilization** activities within 24 hours during the restriction period. Temporary stockpiles without significant silt, clay or organic components (e.g., clean aggregate stockpiles, demolition concrete stockpiles, sand stockpiles) and the constructed base components of roads, parking lots and similar surfaces are exempt from this requirement but must be in compliance with Part IV.C.5.

3. If using **stormwater** conveyance channels ,the **Permittee(s)** must design the channels to route water around unstabilized areas on the site and to reduce erosion, unless **infeasible**. The **Permittee(s)** must use erosion controls and velocity dissipation devices such as check dams, sediment traps, riprap, or grouted riprap at outlets within and along the length of any constructed **stormwater** conveyance channel, and at any outlet, to provide a non-erosive flow velocity, to minimize erosion of channels and their embankments, outlets, adjacent stream banks, slopes, and downstream waters during discharge conditions.

4. The **Permittee(s)** must **stabilize** the **normal wetted perimeter** of any temporary or permanent drainage ditch or swale that drains water from any portion of the construction site, or diverts water around the site, within 200 lineal feet from the property edge, or from the point of discharge into any **surface water**. **Stabilization** of the last 200 lineal feet must be completed within 24 hours after connecting to a **surface water** or property edge.

   The **Permittee(s)** shall complete **stabilization** of the remaining portions of any temporary or permanent ditches or swales within 14 calendar days after connecting to a **surface water** or property edge and construction in that portion of the ditch has temporarily or permanently ceased.

   Temporary or permanent ditches or swales that are being used as a sediment containment system during construction (with properly designed rock-ditch checks, bio rolls, silt dikes, etc.) do not need to be **stabilized** during the temporary period of its use as a sediment containment system. These areas must be **stabilized** within 24 hours after no longer being used as a sediment containment system.

   Applying mulch, hydromulch, tackifier, polyacrylamide or similar **erosion prevention** practices is not acceptable **stabilization** in any part of a temporary or permanent drainage ditch or swale.

5. Pipe outlets must be provided with temporary or permanent **energy dissipation** within 24 hours after connection to a **surface water**.

6. Unless **infeasible** due to lack of pervious or vegetated areas, the **Permittee(s)** must direct discharges from **BMPs** to vegetated areas of the site (including any **natural buffers)** in order to increase sediment removal and maximize **stormwater** infiltration. The **Permittee(s)** must use velocity dissipation devices if necessary to prevent erosion when directing **stormwater** to vegetated areas.

IV.C. <u>SEDIMENT CONTROL PRACTICES</u>

1. The **Permittee(s)** must employ **Sediment control** practices as necessary to minimize sediment from entering **surface waters**, including curb and gutter systems and storm sewer inlets.

a. Temporary or permanent drainage ditches and sediment basins that are designed as part of a sediment containment system (e.g., ditches with rock-check dams) require **sediment control** practices only as appropriate for site conditions.

b. If the down gradient **sediment controls** are overloaded (based on frequent failure or excessive maintenance requirement), the **Permittee(s)** must install additional upgradient **sediment control** practices or redundant **BMPs** to eliminate the overloading, and the **SWPPP** must be amended to identify these additional practices as required in Part III.B 1.-3.

2. **Sediment control** practices must be established on all down gradient perimeters and be located upgradient of any buffer zones. The perimeter **sediment control** practice must be in place before any upgradient land-disturbing activities begin. These practices shall remain in place until **Final Stabilization** has been established in accordance with Part IV.G. A floating silt curtain placed in the water is not a **sediment control BMP** to satisfy perimeter control requirements in this part except when working on a shoreline and below the waterline. In those cases, a floating silt curtain can be used as a perimeter control practice if the floating silt curtain is installed as close to shore as possible. Immediately after the short term construction activity (e.g. installation of rip rap along the shoreline) in that area is complete, an upland perimeter control practice must be installed if exposed soils still drain to the surface water..

3. The **Permittee(s)** shall re-install all **sediment control** practices that have been adjusted or removed to accommodate short-term activities such as clearing or grubbing, or passage of vehicles, immediately after the short-term activity has been completed. The **Permittee(s)** shall complete any short-term activity that requires removal of **sediment control** practices as quickly as possible. The **Permittee(s)** must re-install **sediment control** practices before the next precipitation event even if the short-term activity is not complete.

4. All storm drain inlets must be protected by appropriate **BMPs** during construction until all sources with potential for discharging to the inlet have been **stabilized**. Inlet protection may be removed for a particular inlet if a specific safety concern (street flooding/freezing) has been identified by the **Permittee(s)** or the jurisdictional authority (e.g., city/county/township/MnDOT engineer).The **Permittee(s)** must document the need for removal in the **SWPPP.**

5. Temporary soil stockpiles must have silt fence or other effective **sediment controls**, and cannot be placed in any **natural buffers** or **surface waters**, including **stormwater** conveyances such as curb and gutter systems, or conduits and ditches unless there is a bypass in place for the **stormwater.**

6. Where vehicle traffic leaves any part of the site (or onto paved roads within the site):

   a. The **Permittee(s)** must install a vehicle tracking **BMP** to minimize the track out of sediment from the construction site. Examples of vehicle tracking **BMPs** include (but are not limited to) rock pads, mud mats, slash mulch, concrete or steel wash racks, or equivalent systems.

   b. The **Permittee(s)** must use street sweeping if such vehicle tracking **BMPs** are not adequate to prevent sediment from being tracked onto the street (see Part IV.E.5.d.).

7. The **Permittee(s)** must install temporary sedimentation basins as required in Part III.C. of this permit.

8. The **Permittee(s)** must minimize soil compaction and, unless **infeasible**, preserve topsoil. Minimizing soil compaction is not required where the function of a specific area of the site dictates that it be compacted.

9. The **Permittee(s)** must preserve a 50 foot **natural buffer** or (if a buffer is **infeasible** on the site) provide redundant **sediment controls** when a **surface water** is located within 50 feet of the **project's** earth disturbances and stormwater flows to the **surface water**. **Natural buffers** are not required adjacent to road ditches, judicial ditches, county ditches, **stormwater** conveyance channels, storm drain inlets, and sediment basins. The **Permittee(s)** is/are not required to enhance the quality of the vegetation that already exists in the buffer or provide vegetation if none exist. However, **Permittee(s)** can improve the natural buffer with vegetation.

10. If the **Permittee(s)** intend to use polymers, flocculants, or other sedimentation treatment chemicals on the **project** site, the **Permittee(s)** must comply with the following minimum requirements:

    a. The **Permittee(s)** must use conventional erosion and **sediment controls** prior to chemical addition to ensure effective treatment. Chemicals may only be applied where treated **stormwater** is directed to a **sediment control** system which allows for filtration or settlement of the floc prior to discharge.

    b. Chemicals must be selected that are appropriately suited to the types of soils likely to be exposed during construction, and to the expected turbidity, pH, and flow rate of **stormwater** flowing into the chemical treatment system or area.

    c. Chemicals must be used in accordance with accepted engineering practices, and with dosing specifications and sediment removal design specifications provided by the manufacturer or provider/supplier of the applicable chemicals.

IV.D. <u>DEWATERING AND BASIN DRAINING</u>

1. The **Permittee(s)** must discharge turbid or sediment-laden waters related to **dewatering** or basin draining (e.g., pumped discharges, trench/ditch cuts for drainage) to a temporary or permanent sedimentation basin on the **project** site unless **infeasible**. The **Permittee(s)** may discharge from the temporary or permanent sedimentation basins to **surface waters** if the basin water has been visually checked to ensure adequate treatment has been obtained in the basin and that nuisance conditions (see Minn. R. 7050.0210, subp. 2) will not result from the discharge. If the water cannot be discharged to a sedimentation basin prior to entering the **surface water**, it must be treated with the appropriate **BMPs**, such that the discharge does not adversely affect the receiving water or downstream properties. If the **Permittee(s)** must discharge water that contains oil or grease, the **Permittee(s)** must use an oil-water separator or suitable filtration device (e.g. cartridge filters, absorbents pads) prior to discharging the water. The **Permittee(s)** must ensure that discharge points are adequately protected from erosion and scour. The discharge must be dispersed over natural rock riprap, sand bags, plastic sheeting, or other accepted **energy dissipation** measures.

2. All water from **dewatering** or basin-draining activities must be discharged in a manner that does not cause nuisance conditions, erosion in receiving channels or on downslope properties, or inundation in **wetlands** causing significant adverse impact to the **wetland.**

3. If the **Permittee(s)** is/are using filters with backwash water, the **Permittee(s)** must haul the backwash water away for disposal, return the backwash water to the beginning of the treatment process, or incorporate the backwash water into the site in a manner that does not cause erosion. The Permittee(s) may discharge backwash water to the sanitary sewer if permission is granted by the sanitary sewer authority. The **Permittee(s)** must replace and clean the filter media used in **dewatering** devices when required to retain adequate function.

IV.E. INSPECTIONS AND MAINTENANCE

1. The **Permittee(s)** must ensure that a trained person (as identified in Part III.A.3.a.) will routinely inspect the entire construction site at least once every seven (7) days during active construction and within 24 hours after a rainfall event greater than 0.5 inches in 24 hours. Following an inspection that occurs within 24 hours after a rainfall event, the next inspection must be conducted within seven (7) days after the rainfall event.

2. All inspections and maintenance conducted during construction must be recorded within 24 hours in writing and these records must be retained with the **SWPPP** in accordance with Part III.E. Records of each inspection and maintenance activity shall include:

   a. Date and time of inspections

   b. Name of person(s) conducting inspections

   c. Findings of inspections, including the specific location where corrective actions are needed

   d. Corrective actions taken (including dates, times, and party completing maintenance activities)

   e. Date and amount of all rainfall events greater than 1/2 inch (0.5 inches) in 24 hours. Rainfall amounts must be obtained by a properly maintained rain gauge installed onsite, a weather station that is within 1 mile of your location or a weather reporting system that provides site specific rainfall data from radar summaries.

   f. If any discharge is observed to be occurring during the inspection, a record of all points of the property from which there is a discharge must be made, and the discharge should be described (i.e., color, odor, floating, settled, or suspended solids, foam, oil sheen, and other obvious indicators of pollutants) and photographed.

   g. Any amendments to the **SWPPP** proposed as a result of the inspection must be documented as required in Part III.B. within seven (7) calendar days.

3. Inspection frequency adjustment

   a. Where parts of the **project** site have **permanent cover**, but work remains on other parts of the site, the **Permittee(s)** may reduce inspections of the areas with **permanent cover** to

once per month.

b. Where construction sites have **permanent cover** on all exposed soil areas and no **construction activity** is occurring anywhere on the site, the site must be inspected during non-frozen ground conditions at least once per month for a period of twelve (12) months. Following the twelfth month of **permanent cover** and no **construction activity**, inspections may be terminated until **construction activity** is once again initiated unless the **Permittee(s)** is/are notified in writing by the MPCA that erosion issues have been detected at the site and inspections need to resume.

c. Where work has been suspended due to frozen ground conditions, the inspections may be suspended. The required inspections and maintenance schedule must begin within 24 hours after runoff occurs at the site or 24 hours prior to resuming construction, whichever comes first.

4. The **Permittee(s)** is/are responsible for the inspection and maintenance of temporary and permanent water quality management **BMPs**, as well as all **erosion prevention** and **sediment control BMPs**, until another **Permittee** has obtained coverage under this Permit according to Part II.B.5. or the **project** has undergone **Final Stabilization**, and an **NOT** has been submitted to the MPCA.

5. The **Permittee(s)** must inspect all **erosion prevention** and **sediment control BMPs** and Pollution Prevention Management Measures to ensure integrity and effectiveness during all routine and post-rainfall event inspections. All nonfunctional **BMPs** must be repaired, replaced, or supplemented with functional **BMPs** by the end of the next business day after discovery, or as soon as field conditions allow access unless another time frame is specified below. The **Permittee(s)** must investigate and comply with the following inspection and maintenance requirements:

   a. All perimeter control devices must be repaired, replaced, or supplemented when they become nonfunctional or the sediment reaches one-half (1/2) of the height of the device. These repairs must be made by the end of the next business day after discovery, or thereafter as soon as field conditions allow access.

   b. Temporary and permanent sedimentation basins must be drained and the sediment removed when the depth of sediment collected in the basin reaches one-half (1/2) the storage volume. Drainage and removal must be completed within 72 hours of discovery, or as soon as field conditions allow access (see Part IV.D.).

   c. **Surface waters**, including drainage ditches and conveyance systems, must be inspected for evidence of erosion and sediment deposition during each inspection. The **Permittee(s)** must remove all deltas and sediment deposited in **surface waters**, including drainage ways, catch basins, and other drainage systems, and restabilize the areas where sediment removal results in exposed soil. The removal and **stabilization** must take place within seven (7) days of discovery unless precluded by legal, regulatory, or physical access constraints. The **Permittee(s)** shall use all reasonable efforts to obtain access. If precluded, removal and **stabilization** must take place within seven (7) calendar days of obtaining access. The **Permittee(s)** is/are responsible for contacting all local, regional, state and federal authorities and receiving any applicable permits, prior to conducting any work in surface waters.

d. Construction site vehicle exit locations must be inspected for evidence of off-site sediment tracking onto paved surfaces. Tracked sediment must be removed from all paved surfaces both on and off site within 24 hours of discovery, or if applicable, within a shorter time to comply with Part IV.C.6.

e. Streets and other areas adjacent to the **project** must be inspected for evidence of off-site accumulations of sediment. If sediment is present, it must be removed in a manner and at a frequency sufficient to minimize off-site impacts (e.g., fugitive sediment in streets could be washed into storm sewers by the next rain and/or pose a safety hazard to users of public streets).

6. All infiltration areas must be inspected to ensure that no sediment from ongoing **construction activity** is reaching the infiltration area. All infiltration areas must be inspected to ensure that equipment is not being driven across the infiltration area.

IV.F. POLLUTION PREVENTION MANAGEMENT MEASURES

The **Permittee(s)** shall implement the following pollution prevention management measures on the site:

1. Storage, Handling, and Disposal of Construction Products, Materials, and Wastes: The **Permittee(s)** shall comply with the following to minimize the exposure to **stormwater** of any of the products, materials, or wastes. Products or wastes which are either not a source of contamination to stormwater or are designed to be exposed to stormwater are not held to this requirement:

   a. Building products that have the potential to leach pollutants must be under cover (e.g., plastic sheeting or temporary roofs) to prevent the discharge of pollutants or protected by a similarly effective means designed to minimize contact with **stormwater**.

   b. Pesticides, herbicides, insecticides, fertilizers, treatment chemicals, and landscape materials must be under cover (e.g., plastic sheeting or temporary roofs) to prevent the discharge of pollutants or protected by similarly effective means designed to minimize contact with **stormwater**.

   c. Hazardous materials, toxic waste, (including oil, diesel fuel, gasoline, hydraulic fluids, paint solvents, petroleum-based products, wood preservatives, additives, curing compounds, and acids) must be properly stored in sealed containers to prevent spills, leaks or other discharge. Restricted access storage areas must be provided to prevent vandalism. Storage and disposal of hazardous waste or hazardous materials must be in compliance with Minn. R. ch. 7045 including secondary containment as applicable.

   d. Solid waste must be stored, collected and disposed of properly in compliance with Minn. R. ch. 7035.

   e. Portable toilets must be positioned so that they are secure and will not be tipped or knocked over. Sanitary waste must be disposed of properly in accordance with Minn. R. ch. 7041.

2. Fueling and Maintenance of Equipment or Vehicles; Spill Prevention and Response: The **Permittee(s)** shall take reasonable steps to prevent the discharge of spilled or leaked chemicals, including fuel, from any area where chemicals or fuel will be loaded or unloaded including the use of drip pans or absorbents unless infeasible. The **Permittee(s)** must conduct fueling in a contained area unless infeasible. The **Permittee(s)** must ensure adequate supplies are available at all times to clean up discharged materials and that an appropriate disposal method is available for recovered spilled materials. The **Permittee(s)** must report and clean up spills immediately as required by Minn. Stat. § 115.061, using dry clean up measures where possible.

3. Vehicle and equipment washing: If the **Permittee(s)** wash the exterior of vehicles or equipment on the **project** site, washing must be limited to a defined area of the site. Runoff from the washing area must be contained in a sediment basin or other similarly effective controls and waste from the washing activity must be properly disposed of. The **Permittee(s)** must properly use and store soaps, detergents, or solvents. No engine degreasing is allowed on site.

4. Concrete and other washouts waste: The **Permittee(s)** must provide effective containment for all liquid and solid wastes generated by washout operations (concrete, stucco, paint, form release oils, curing compounds and other construction materials) related to the **construction activity**. The liquid and solid washout wastes must not contact the ground, and the containment must be designed so that it does not result in runoff from the washout operations or areas. Liquid and solid wastes must be disposed of properly and in compliance with MPCA rules. A sign must be installed adjacent to each washout facility that requires site personnel to utilize the proper facilities for disposal of concrete and other washout wastes.

IV.G. FINAL STABILIZATION

The **Permittee(s)** must ensure **Final Stabilization** of the site. **Final Stabilization** is not complete until all requirements of Parts IV.G.1-5. are complete:

1. All soil disturbing activities at the site have been completed and all soils are **stabilized** by a uniform perennial vegetative cover with a density of 70 percent of its expected final growth density over the entire pervious surface area, or other equivalent means necessary to prevent soil failure under erosive conditions.

2. The permanent **stormwater** management system is constructed, meets all requirements in Part III.D. and is operating as designed. Temporary or permanent sedimentation basins that are to be used as permanent water quality management basins have been cleaned of any accumulated sediment. All sediment has been removed from conveyance systems and ditches are **stabilized** with **permanent cover**.

3. All temporary synthetic and structural **erosion prevention** and **sediment control BMPs** (such as silt fence) have been removed on the portions of the site for which the **Permittee(s)** is/are responsible. **BMPs** designed to decompose on site (such as some compost logs) may be left in place.

4. For residential construction only, individual lots are considered finally **stabilized** if the structure(s) are finished and **temporary erosion protection** and downgradient perimeter control has been completed and the residence has been sold to the homeowner. Additionally, the **Permittee** has distributed the MPCA's "**Homeowner Fact Sheet"** to the homeowner to inform

the homeowner of the need for, and benefits of, **permanent cover**.

5. For construction **projects** on agricultural land (e.g., pipelines across crop, field pasture or range land) the disturbed land has been returned to its preconstruction agricultural use.

PART V. GENERAL PROVISIONS

V.A. APPLICABILITY CRITERIA

1. If the **Commissioner** determines that pollution in **stormwater** discharges associated with a **construction activity** are contributing to a violation of a water quality standard or due to specific site considerations rendering a substantial portion of the requirements of this permit impossible to comply with, and the **Commissioner** determines that the **construction activity** would be more appropriately regulated by an individual permit, the **Commissioner** may terminate coverage under this general permit and require the **owner and operator** to continue the **construction activity** subject to an individual **stormwater** discharge permit. Upon issuance of an individual permit, this general permit would no longer apply. Prior to termination of coverage under this general permit, the **Commissioner** will provide notice and an opportunity to request a contested case hearing.

2. If the terms and conditions of this general permit cannot be met, an **owner** may request an individual permit, in accordance with Minn. R. 7001.0210 subp. 6.

3. Any interested person may petition the MPCA to require an individual **NPDES**/SDS permit in accordance with 40 CFR 122.28(b)(3).

V.B. RECORD AVAILABILITY

1. The **Permittee(s)** must make the **SWPPP**, including all certificates, reports, records, or other information required by this permit, available to federal, state, and local officials within 72 hours upon request for the duration of the permit and for three (3) years following the **NOT**. This does not include any records after submittal of the **NOT**.

2. When requested by the MPCA, the **Permittee(s)** must make the responsible person trained as required in Part III.F.1.b. or Part III.F.1.c. available to be onsite during an MPCA inspection within 72 hours of a request.

V.C. PROHIBITIONS

This permit prohibits discharges of any material other than **stormwater** treated in compliance with this permit and discharges from **dewatering** or basin draining activities in accordance with Part IV.D.1.-2. Prohibited discharges include (but are not limited to) wastewater from washout of concrete, stucco, paint, form release oils, curing compounds and other construction materials, fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance, soaps or solvents used in vehicle and equipment washing and maintenance, and other hazardous substances or wastes.

V.D. TRANSFER OF OWNERSHIP OR CONTROL

This permit may not be assigned or transferred by the **Permittee(s)** except when transfer occurs in accordance with the applicable requirements of Part II.B.5.

V.E. CIVIL AND CRIMINAL LIABILITY

Nothing in this permit must be construed to relieve the **Permittee(s)** from civil or criminal penalties for noncompliance with the terms and conditions provided herein. Nothing in this permit must be construed to preclude the initiation of any legal action or relieve the **Permittee(s)** from any responsibilities, liabilities, or penalties to which the **Permittee(s)** is/are or may be subject to under Section 311 of the Clean Water Act and Minn. Stat. § 115 and 116, as amended. The **Permittee(s)** is/are not liable for permit requirements for activities occurring on those portions of a site where the permit has been transferred to another party as required in Part II.B.5. or the **Permittee(s) has/**have submitted the **NOT** as required in Part II.C.

V.F. SEVERABILITY

The provisions of this permit are severable. If any provision of this permit, or the application of any provision of this permit to any circumstances, is held invalid, the application of such provision to other circumstances, and the remainder of this permit must not be affected thereby.

V.G. NPDES/SDS RULE STANDARD GENERAL CONDITIONS

The **Permittee(s)** must comply with the provisions of Minn. R. 7001.0150, subp. 3 and Minn. R. 7001.1090, subp. 1(A), 1(B), 1(C), 1(H), 1(I), 1(J), 1(K), and 1(L).

V.H. INSPECTION AND ENTRY

The **Permittee(s)** must allow access as provided in 40 CFR 122.41(i) and Minn. Stat. § 115.04. The **Permittee(s)** shall allow representatives of the MPCA or any member, employee or agent thereof, when authorized by it, upon presentation of credentials, to enter upon any property, public or private, for the purpose of obtaining information or examination of records or conducting surveys or investigations.

APPENDIX A

A. GENERAL REQUIREMENTS

All requirements in this Appendix are in addition to **BMPs** already specified in the permit. Where provisions of Appendix A, conflict with requirements elsewhere in the permit, the provisions in Appendix A take precedence. All **BMPs** used to comply with this Appendix must be documented in the **SWPPP** for the **project**. If the terms and conditions of this Appendix cannot be met, an individual permit will be required in accordance with Minn. R. ch. 7001.

B. REQUIREMENTS FOR DISCHARGES TO SPECIAL WATERS AND IMPAIRED WATERS

Additional **BMPs** and enhanced runoff controls identified in this Part are required for discharges to the following special waters (Part B.1 through B.9 of Appendix A) and impaired waters (Part B.10 of Appendix A). The **BMPs** identified for each special or impaired water are required for those areas of

the **project** draining to a discharge point on the **project** that is within one mile (**aerial radius measurement**) of special or impaired water and flows to that special or impaired water.

1. Wilderness areas: Boundary Waters Canoe Area Wilderness; Voyageurs National Park; Kettle River from the site of the former dam at Sandstone to its confluence with the Saint Croix River; Rum River from Ogechie Lake spillway to the northernmost confluence with Lake Onamia. Discharges to these waters must incorporate the **BMPs** outlined in C.1., C.2., and C.3. of this Appendix.

2. Mississippi River: Those portions from Lake Itasca to the southerly boundary of Morrison County that are included in the Mississippi Headwaters Board comprehensive plan dated February 12, 1981. Discharges to these waters must incorporate the **BMPs** outlined in C.1., C.2. and C.3. of this Appendix.

3. Scenic or recreational river segments: Saint Croix River, entire length; Cannon River from northern city limits of Faribault to its confluence with the Mississippi River; North Fork of the Crow River from Lake Koronis outlet to the Meeker-Wright county line; Kettle River from north Pine County line to the site of the former dam at Sandstone; Minnesota River from Lac qui Parle dam to Redwood County State Aid Highway 11; Mississippi River from County State Aid Highway 7 bridge in Saint Cloud to northwestern city limits of Anoka; and Rum River from State Highway 27 bridge in Onamia to Madison and Rice streets in Anoka. Discharges to these waters must incorporate the **BMPs** outlined in C.1., C.2. and C.3. of this Appendix.

4. Lake Superior: (Prohibited and restricted) Discharges to Lake Superior must incorporate the **BMPs** outlined in C.1., C.2. and C.3. of this Appendix.

5. Lake Trout Lakes: Identified in Minn. R. 7050.0470, including those inside the boundaries of the Boundary Waters Canoe Area Wilderness and Voyageurs National Park. Discharges to these waters must incorporate the **BMPs** outlined in C.1., C.2., and C.3. of this Appendix.

6. Trout Lakes: Identified in Minn. R. 6264.0050, subp. 2. Discharges to these waters must incorporate the **BMPs** outlined in C.1., C.2., and C.3., of this Appendix.

7. Scientific and natural areas: Boot Lake, Anoka County; Kettle River in sections 15, 22, 23, T 41 N, R 20, Pine County; Pennington Bog, Beltrami County; Purvis Lake-Ober Foundation, Saint Louis County; waters within the borders of Itasca Wilderness Sanctuary, Clearwater County; Iron Springs Bog, Clearwater County; Wolsfeld Woods, Hennepin County; Green Water Lake, Becker County; Blackdog Preserve, Dakota County; Prairie Bush Clover, Jackson County; Black Lake Bog, Pine County; Pembina Trail Preserve, Polk County; and Falls Creek, Washington County. Discharges to these waters must incorporate the **BMPs** outlined in C.1., C.2., and C.3. of this Appendix.

8. Trout Streams: Listed in Minn. R. 6264.0050, subp. 4. Discharges to these waters must incorporate the **BMPs** outlined in C.1., C.2., C.3., and C.4. of this Appendix.

9. Calcareous Fens: Listed in Minn. R 7050.0180 subp.6b. Discharges to these Calcareous Fens must incorporate the **BMPs** outlined in C.1. and C.2. of this Appendix.

10. Impaired Waters: Waters identified as impaired under section 303 (d) of the federal Clean Water

Act for phosphorus (nutrient eutrophication biological indicators), turbidity, dissolved oxygen or aquatic biota (fish bioassessment, aquatic plant bioassessment and aquatic macroinvertebrate bioassessment).

a. Impaired Water Without an Approved TMDL or With an Approved TMDL and No Waste Load Allocation:

   If runoff from the site discharges to an impaired water, and a TMDL has not been approved by USEPA or there is a USEPA approved TMDL that does not establish a Waste Load Allocation (WLA) for construction **stormwater**, discharges to these waters must incorporate the **BMPs** outlined in C.1. and C.2. of this Appendix.

b. Impaired Water With an Approved TMDL and WLA:

   If runoff from the site discharges to an impaired water for which there is a USEPA approved TMDL that establishes a WLA for construction **stormwater**, and the TMDL does not identify any specific implementation activities that would apply to the site discharges, discharges to these waters must incorporate the **BMPs** outlined in C.1. and C.2. of this Appendix.

   If the TMDL identifies specific implementation activities regarding construction **stormwater** that would apply to the site discharges, the **Permittee(s)** must include the following in the **SWPPP**:

   i. Identify the receiving water, the areas of the site discharging to it, and the pollutant(s) identified in the TMDL and

   ii. **BMPs** identified in the TMDL and any other specific construction **stormwater** related implementation activities identified in the TMDL.

Note on impaired waters listing terminology: The terms in parenthesis in Appendix A, Part B.10. above are the most current terminology used to list waters as impaired at the time of permit issuance. These terms are subject to change. For example, at one time waters were listed as impaired for phosphorus and now those same waters are listed as impaired for nutrient eutrophication biological indicators. If the terminology changes for one of the pollutant(s) or stressor(s) identified in the permit, the MPCA will keep a list of the new terms on its construction **stormwater** website.

C. ADDITIONAL **BMPS** FOR SPECIAL WATERS AND IMPAIRED WATERS

For the **BMPs** described in C.2., and C.4. of this Appendix:

Where the proximity to bedrock precludes the installation of any of the permanent **stormwater** management practices outlined in Appendix A, other treatment (such as grassed swales, smaller ponds, or grit chambers) is required prior to discharge to **surface waters**.

For work on linear **projects** with lack of right-of-way where the **Permittee(s)** cannot obtain an easement or other permission for property needed to install treatment systems capable of treating the entire **water quality volume** on site, the **Permittee(s)** must maximize the **water quality volume** that can be treated prior to discharge to **surface waters**. Treatment can be provided through other

methods or combination of methods such as grassed swales, filtration systems, smaller ponds or grit chambers prior to discharge to **surface waters**. A reasonable attempt must be made to obtain right-of-way during the **project** planning process. Documentation of these attempts must be in the **SWPPP** per Part III.A.5.m. in the section addressing **infeasibility**.

1. During construction:

    a. **Stabilization** of all exposed soil areas must be **initiated immediately** to limit soil erosion but in no case completed later than seven (7) days after the **construction activity** in that portion of the site has temporarily or permanently ceased.

    b. Temporary sediment basin requirements described in Part III.C. must be used for common drainage locations that serve an area with five (5) or more acres disturbed at one time.

2. Post construction: The **water quality volume** that must be retained on site by the **project's** permanent **stormwater** management system described in Part III.D. shall be one (1) inch of runoff from the new **impervious surfaces** created by the **project**. See Part III.D.1. for more information on infiltration design, prohibitions and appropriate site conditions.

3. Buffer zone: The **Permittee(s)** shall include an undisturbed buffer zone of not less than 100 linear feet from the special water (not including tributaries) and this buffer zone shall be maintained at all times, both during construction and as a permanent feature post construction, except where a water crossing or other encroachment is necessary to complete the **project**. The **Permittee(s)** must fully document the circumstance and reasons that the buffer encroachment is necessary in the **SWPPP** and include restoration activities. Replacement of existing **impervious surface** within the buffer is allowed under this permit. All potential water quality, scenic and other environmental impacts of these exceptions must be minimized by the use of additional or redundant **BMPs** and documented in the **SWPPP** for the **project**.

4. Temperature Controls: The **Permittee(s)** must design the Permanent **Stormwater** Management System such that the discharge from the **project** will minimize any increase in the temperature of trout stream receiving waters resulting from the one (1)-and two (2)-year 24-hour precipitation events. This includes all tributaries of designated trout streams within the Public Land Survey System (PLSS) Section that the trout stream is located. **Projects** that discharge to trout streams must minimize the impact using one or more of the following measures, in order of preference:

    a. Minimize new **impervious surfaces**.

    b. Minimize the discharge from connected **impervious surfaces** by discharging to vegetated areas, or grass swales, and through the use of other non-structural controls.

    c. Infiltration or other volume reduction practices to reduce runoff in excess of pre-**project** conditions (up to the two (2)-year 24-hour precipitation event).

    d. If ponding is used, the design must include an appropriate combination of measures such as shading, filtered bottom withdrawal, vegetated swale discharges or constructed wetland treatment cells that will limit temperature increases. The pond should be designed to draw down in 24 hours or less.

e. Other methods that will minimize any increase in the temperature of the trout stream.

D. REQUIREMENTS FOR DISCHARGING TO WETLANDS

If the **project** has any discharges with the potential for significant adverse impacts to a **wetland,** (e.g., conversion of a natural **wetland** to a **stormwater** pond) the **Permittee(s)** must demonstrate that the **wetland** mitigative sequence has been followed in accordance with D.1 or D.2 of this Appendix.

1. If the potential adverse impacts to a **wetland** on a specific **project** site have been addressed by permits or other approvals from an official statewide program (U.S. Army Corps of Engineers 404 program, Minnesota DNR, or the State of Minnesota Wetland Conservation Act) that are issued specifically for the **project** and **project** site, the **Permittee(s)** may use the permit or other determination issued by these agencies to show that the potential adverse impacts have been addressed. For the purposes of this permit, deminimus actions are determinations by the permitting agency that address the **project** impacts, whereas a non-jurisdictional determination does not address **project** impacts.

2. If there are impacts from the **project** that are not addressed in one of the permits or other determinations discussed in Appendix A, Part D.1. (e.g., permanent inundation or flooding of the **wetland**, significant degradation of water quality, excavation, filling, draining), the **Permittee(s)** must minimize all adverse impacts to **wetlands** by utilizing appropriate measures. Measures used must be based on the nature of the **wetland**, its vegetative community types and the established hydrology. These measures include in order of preference:

   a. Avoid all significant adverse impacts to **wetlands** from the **project** and post-**project** discharge.

   b. Minimize any unavoidable impacts from the **project** and post-**project** discharge.

   c. Provide compensatory mitigation when the **Permittee(s)** determine(s) that there is no reasonable and practicable alternative to having a significant adverse impact on a **wetland**. For compensatory mitigation, **wetland** restoration or creation shall be of the same type, size and whenever reasonable and practicable in the same watershed as the impacted **wetland**.

E. DISCHARGES REQUIRING ENVIRONMENTAL REVIEW

This permit does not replace or satisfy any environmental review requirements, including those under the Minnesota Environmental Policy Act or the National Environmental Policy Act. The **owner** must verify that any environmental review required by law, including any required Environmental Assessment Work sheets or Environmental Impact Statements, Federal environmental review, or other required review is complete before making application for coverage under this permit, and the **owner** must incorporate any **stormwater** mitigation measures required as the result of any environmental review into the **SWPPP** for the **project**. If any part of your **common plan of development or sale** requires environmental review, coverage under this permit cannot be obtained until such environmental review is complete.

F. DISCHARGES AFFECTING ENDANGERED OR THREATENED SPECIES

This permit does not replace or satisfy any review requirements for endangered or threatened species, from new or expanded discharges that adversely impact or contribute to adverse impacts on a listed endangered or threatened species, or adversely modify a designated critical habitat. The **owner** must conduct any required review and coordinate with appropriate agencies for any **project** with the potential of affecting threatened or endangered species, or their critical habitat.

G. DISCHARGES AFFECTING HISTORIC PLACES OR ARCHEOLOGICAL SITES

This permit does not replace or satisfy any review requirements for historic places or archeological sites, from new or expanded discharges that adversely affect properties listed or eligible for listing in the National Register of Historic Places or affecting known or discovered archeological sites. The **owner** must be in compliance with National Historic Preservation Act and conduct all required review and coordination related to historic preservation, including significant anthropological sites and any burial sites, with the Minnesota Historic Preservation Officer.

APPENDIX B. – DEFINITIONS

1. **"Aerial radius measurement"** means the shortest straight line distance measurement between the point of **stormwater** discharge from a **project** construction site to the nearest edge of the water body the **stormwater** will flow to. This measurement does not follow the meander flow path.

2. **"Best Management Practices (BMPs)"** means the most effective and practicable means of **erosion prevention** and **sediment control**, and water quality management practices that are the most effective and practicable means of to control, prevent, and minimize degradation of **surface water**, including avoidance of impacts, construction-phasing, minimizing the length of time soil areas are exposed, prohibitions, pollution prevention through good housekeeping, and other management practices published by state or designated area-wide planning agencies.

   Individual **BMPs** found in this permit are described in the current versions of Protecting Water Quality in Urban Areas, MPCA and The Minnesota Stormwater Manual, MPCA. **BMPs** must be adapted to the site and can be adopted from other sources. However, they must be similar in purpose and at least as effective and stringent as MPCA's **BMPs**. (Other sources include manufacturers specifications, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices, U.S. Environmental Protection Agency 1992, and Erosion Control Design Manual, Minnesota Department of Transportation, et al, 1993).

3. **"Commissioner"** means the **Commissioner** of the MPCA or the **Commissioner's** designee.

4. **"Common Plan of Development or Sale"** means a contiguous area where multiple separate and distinct land-disturbing activities may be taking place at different times, on different schedules, but under one proposed plan. One plan is broadly defined to include design, permit application, advertisement or physical demarcation indicating that land-disturbing activities may occur.

5. **"Construction Activity"** includes **construction activity** as defined in 40 C.F.R. pt. 122.26(b)(14)(x) and small construction activity as defined in 40 C.F.R. pt. 122.26(b)(15) and **construction activity** as defined by Minn. R. 7090.0080, subp. 4. This includes a disturbance to the land that results in a change in the topography, existing soil cover (both vegetative and non-vegetative), or the existing soil topography that may result in accelerated **stormwater** runoff, leading to soil erosion and

movement of sediment into **surface waters** or drainage systems. Examples of **construction activity** may include clearing, grading, filling, and excavating. **Construction activity** includes the disturbance of less than one acre of total land area that is a part of a larger **common plan of development or sale** if the larger common plan will ultimately disturb one (1) acre or more. **Construction activity** does not include a disturbance to the land of less than five (5) acres for the purpose of routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of the facility.

6. **"Dewatering"** means the removal of surface or ground water to dry and/or solidify a construction site to enable **construction activity**. Dewatering may require a Minnesota Department of Natural Recourses water appropriation permit and, if dewatering water is contaminated, discharge of such water may require an individual MPCA **NPDES**/SDS permit.

7. **"Energy Dissipation"** means methods employed at pipe outlets to prevent erosion caused by the rapid discharge of water scouring soils. Examples include, but are not limited to: concrete aprons, riprap, splash pads, and gabions that are designed to prevent erosion.

8. **"Erosion Prevention"** means measures employed to prevent erosion. Examples include but not limited to: soil **stabilization** practices, limited grading, mulch, **temporary erosion protection** or **permanent cover**, and construction phasing.

9. **"Final Stabilization"** means required actions in Part IV.G. taken after the completion of **construction activities** and prior to submitting the **NOT** that are intended to prevent discharge of pollutants associated with stormwater discharges from the **project**.

10. **"Homeowner Fact Sheet"** means a fact sheet developed by the MPCA and available on the MPCA Construction **Stormwater** website to be given to homeowners at the time of sale by a builder to inform the homeowner of the need for, and benefits of, **Final Stabilization**.

11. **"Infeasible"** means not technologically possible or not economically practicable and achievable in light of the best industry practices.

12. **"Initiated immediately"** means taking an action to commence **stabilization** as soon as practicable, but no later than the end of the work day, following the day when the earth-disturbing activities have temporarily or permanently ceased, if the **Permittee(s)** know that construction work on that portion of the site will be temporarily ceased for 14 or more additional calendar days or 7 calendar days where Appendix A.C.1.a applies. The following activities can be taken to initiate **stabilization**:

    1. prepping the soil for vegetative or non-vegetative **stabilization**

    2. applying mulch or other non-vegetative product to the exposed soil area

    3. seeding or planting the exposed area

    4. starting any of the activities in # 1 – 3 on a portion of the area to be **stabilized**, but not on the entire area and

    5. finalizing arrangements to have **stabilization** product fully installed in compliance with the applicable deadline for completing **stabilization**

13. **"Impervious Surface"** means a constructed hard surface that either prevents or retards the entry of water into the soil and causes water to run off the surface in greater quantities and at an increased rate of flow than prior to development. Examples include rooftops, sidewalks, patios, driveways, parking lots, storage areas, and concrete, asphalt, or gravel roads.

14. **"National Pollutant Discharge Elimination System (NPDES)"** means the program for issuing, modifying, revoking, reissuing, terminating, monitoring, and enforcing permits under the Clean Water Act (Sections 301, 318, 402, and 405) and United States Code of Federal Regulations Title 33, Sections 1317, 1328, 1342, and 1345.

15. **"Natural Buffer"** means an area of undisturbed cover surrounding surface waters within which construction activities are restricted. **Natural buffer** includes the vegetation, exposed rock, or barren ground that exists prior to commencement of earth-disturbing activities.

16. **"Normal Wetted Perimeter"** means the area of a conveyance, such as a ditch, channel, or pipe that is in contact with water during flow events that are expected to occur from a two-year 24-hour storm event.

17. **"Notice of Termination (NOT)"** means notice to terminate coverage under this permit after construction is complete, the site has undergone **Final Stabilization**, and maintenance agreements for all permanent facilities have been established, in accordance with all applicable conditions of this permit.

18. **"Operator"** means the person designated by the **owner**, who has day to day operational control and/or the ability to modify **project** plans and specifications related to the **SWPPP**. The operator must be named on the permit as a **Permittee**.

19. **"Owner"** means the person or party possessing the title of the land on which the construction activities will occur; or if the **construction activity** is for a lease, easement, or mineral rights license holder, the party or individual identified as the lease, easement or mineral rights license holder; or the contracting government agency responsible for the **construction activity**.

20. **"Permanent Cover"** means surface types that will prevent soil failure under erosive conditions. Examples include: gravel, asphalt, concrete, rip rap, roof tops, perennial cover, or other landscaped material that will permanently arrest soil erosion. A uniform perennial vegetative cover (i.e. evenly distributed, without large bare areas) with a density of 70 percent of the native background vegetative cover for the area must be established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures. **Permanent cover** does not include the practices listed under **temporary erosion protection**.

21. **"Permittee(s)"** means the person or persons, firm, or governmental agency or other entity that signs the application submitted to the MPCA and is responsible for compliance with the terms and conditions of this permit.

22. **"Project(s)"** means all **construction activity** that is planned and/or conducted under a particular permit. The **project** will occur on the site or sites described in the permit application, the **SWPPP** and in the associated plans, specifications and contract documents.

23. "**Public Waters**" means all water basins and watercourses that are described in Minn. Stat. § 103G.005 subd. 15.

24. **"Saturated Soil"** means the highest seasonal elevation in the soil that is in a reduced chemical state because of soil voids being filled with water **Saturated soil** is evidenced by the presence of redoximorphic features or other information.

25. **"Sediment Control"** means methods employed to prevent sediment from leaving the site. **Sediment control** practices include silt fences, sediment traps, earth dikes, drainage swales, check dams, subsurface drains, bio rolls, rock logs, compost logs, storm drain inlet protection, and temporary or permanent sedimentation basins. A floating silt curtain placed in the water is not a **sediment control BMP** to satisfy perimeter control requirements, except as provided for in Part IV.C.2.

26. **"Stabilize, Stabilized, Stabilization"** means the exposed ground surface has been covered by appropriate materials such as mulch, staked sod, riprap, erosion control blanket, mats or other material that prevents erosion from occurring. Grass, agricultural crop or other seeding alone is not **stabilization**. Mulch materials must achieve approximately 90 percent ground coverage (typically 2 ton/acre).

27. **"Standard details"** means generic drawings showing a common or repeated **construction activity** or practice.

28. **"Stormwater"** is defined under Minn. R. 7077.0105, subp. 41(b), and includes precipitation runoff, **stormwater** runoff, snowmelt runoff, and any other surface runoff and drainage.

29. **"Steep Slopes"** means slopes that are 1:3 (V:H) (33.3 percent) or steeper in grade.

30. **"Storm Water Pollution Prevention Plan (SWPPP)"** means a plan for **stormwater** discharge that includes all required content under Part III of this Permit and which describes the **erosion prevention BMPs**, **sediment control BMPs** and Permanent **Stormwater** Management Systems that, when implemented, will decrease soil erosion on a parcel of land and decrease off-site nonpoint pollution.

31. **"Surface Water or Waters"** means all streams, lakes, ponds, marshes, **wetlands**, reservoirs, springs, rivers, drainage systems, waterways, watercourses, and irrigation systems whether natural or artificial, public or private, except that **surface waters** do not include treatment basins or ponds that were constructed from upland. Treatment basins or ponds that were constructed in **wetlands** and mitigated in accordance with Appendix A.D are also not considered surface waters for purposes of this permit.

32. **"Temporary Erosion Protection"** means methods employed to prevent erosion during construction activities. Examples of **temporary erosion protection** include, but are not limited to: straw, wood fiber blanket, wood chips, vegetation, mulch, and rolled erosion control products.

33. **"Underground Waters"** means water contained below the surface of the earth in the saturated zone including, without limitation, all waters whether under confined, unconfined, or perched conditions, in near surface unconsolidated sediment or regolith, or in rock formations deeper underground. The term ground water shall be synonymous with underground water.

34. **"Waters of the State"** (as defined in Minn. Stat. § 115.01, subd. 22) means all streams, lakes, ponds, marshes, watercourses, waterways, wells, springs, reservoirs, aquifers, irrigation systems, drainage systems and all other bodies or accumulations of water, surface or underground, natural or artificial, public or private, which are contained within, flow through, or border upon the state or any portion thereof.

35. **"Water Quality Volume"** means one (1) inch of runoff from the new **impervious surfaces** created by this **project** (calculated as an instantaneous volume) and is the volume of water to be treated in the Permanent **Stormwater** Management System, as required by this permit.

36. **"Wetland" or "Wetlands"** is defined in Minn. R. 7050.0186, subp. 1a.B. and includes those areas that are inundated or saturated by **surface water** or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in **saturated soil** conditions. **Wetlands** generally include swamps, marshes, bogs, and similar areas. Constructed wetlands designed for wastewater treatment are not **waters of the state**. **Wetlands** must have the following attributes:

    a. A predominance of hydric soils

    b. Inundated or saturated by **surface water** or groundwater at a frequency and duration sufficient to support a prevalence of hydrophytic vegetation typically adapted for life in a **saturated soil** condition and

    c. Under normal circumstances support a prevalence of such vegetation.

Building a Better World for All of Us®

TECHNICAL MEMORANDUM

TO: Bruce Irish, PE – MNDOT

FROM: Justin Klabo, PE – Water Resources Engineer
Anne Haws, EIT – Water Resources Engineer

DATE: March 20, 2014

RE: I-35W Drainage Corridor Study
Hennepin County West Lake Street Improvements
Stormwater Review
SEH No. HENNC 113114

Background

In October 2006, SRF Consulting Group, Inc. conducted a stormwater analysis of the West Lake Street Reconstruction Project. This project is part of the Hennepin County Project Number 97-54, and includes the reconstruction of West Lake Street between Dupont Avenue South and Blaisdell Avenue South. The intent of the SRF study was to propose a design that complies with the County State Aid Highway Requirements for the project. The SRF study showed that the existing storm sewer system was undersized to meet the 10-year design event which resulted in overland street flow as a result of the limited pipe capacity. To solve this problem, SRF proposed the construction of a stormwater diversion system and extensive storm sewer upsizing beyond the project boundary.

The stormwater diversion system between Garfield and Blaisdell Avenue was proposed to be constructed as part of the West Lake Street Reconstruction Project. Additionally, it was proposed to replace the existing storm system outside of the project from Blaisdell and West Lake Street to the 31st Street drop shaft. This was not expected to be constructed until well into the future. Therefore, an interim condition that includes the diversion system and a series of orifices were proposed to be in place until future improvements were made.

Currently, SEH is conducting a study for Hennepin County as part of the I-35W Corridor Project. The hydrologic and hydraulic XPSWMM model that is being used as the base model for this study was provided by the City of Minneapolis. This model includes the trunk storm sewer lines and streets that are tributary to the I-35W Tunnel watershed. The West Lake Street Reconstruction Project area is within this watershed, and therefore is included in the model.

Purpose and Methodology

The purpose of this memorandum is to compare the interim condition that was proposed in the SRF study to the existing conditions XPSWMM model provided to SEH by the City of Minneapolis (SEH model). This comparison will ensure that the I-35W Corridor Study existing conditions XPSWMM model is an accurate representation of the storm sewer system in place today.

The following process was used to make a clear comparison. First the interim condition specified in the SRF Study is clearly defined. This includes the assumed location, size and type of storm sewer pipe, diversion or orifice. The attached SRF memorandum, West Lake Street Storm Water Analysis, is used as reference throughout this process.

Next, the SEH model is analyzed for the presence, size, and location of storm sewer pipes, diversion weirs, orifices within the West Lake Street Reconstruction Project area. Finally, any differences between the SRF study and the SEH model are documented in the conclusions below.

SRF Study Interim Condition

The SRF Study has specified that the interim condition contains the following storm sewer system features. See attached memo titled, West Lake Street Storm Water Analysis, for reference.

Table 1. SRF Study Infrustructure Improvements

Type of Proposed Feature	Location	Size	Shape/Type	Implimentation (Interim or Future)[1]
Bypass Overflow System	Along West Lake St from Garfield Ave through Blaisdell Ave	36-54 in	RCP	INTERIM
Bypass Overflow System Connection into Existing	West Lake St and Blaisdell Ave	24-in	RCP	INTERIM
Diversion Weirs	West Lake St Garfield Ave	Not Specified	Not Specified	INTERIM
	West Lake St and Harriet Ave			
	West Lake St and Pleasant Ave			
Orifices	West Lake St and Garfield Ave	12 - in	Not Specified	INTERIM
	West Lake St and Harriet Ave			
	West Lake St and Grand Ave			
	West Lake St and Pleasant Ave			
Storm Sewer Replacement	From West Lake St and Blaisdell Ave to 31st St Dropshaft	60-66 in	RCP	FUTURE

[1]INTERIM signifies that the SRF Study proposes this feature will be in place during interim conditions, FUTURE specifies it will be constructed after tunnel flooding issue is resolved

SEH Model Comparison

The SEH Model contains the following storm sewer system features within the West Lake Street System. Table 2 below summarizes the features included in the SEH Model. The table details the location of the features, design details, and any differences between the SRF study and the SEH Model. See attached Figure 1 for storm water feature locations within the SEH Model.

Table 2. XPSWMM Comparison

Type of Proposed Feature	Location	Included in SEH Model	SEH Model Design Details	SEH Model Link/Node Name	Notes
Bypass Overflow System	Along West Lake St from Garfield Ave through Blaisdell Ave	YES	36-54 in RCP	Link LMH136 -Link LGC3	2
Bypass Overflow System Connection into Existing	West Lake St and Blaisdell Ave	YES-MODIFIED FROM STUDY	24-in RCP	Link LMH195	Not clear in SRF Study location of connection (see conclusion)
Diversion Weirs	West Lake St Garfield Ave	NO	N/A	N/A	SEH Model does not include diversion weir at Garfield Ave
	West Lake St and Harriet Ave	YES	Transverse Weir (8-ft in length)	LMH148-1	2
	West Lake St and Pleasant Ave	YES	Transverse Weir (8-ft in length)	LV14497-1	2
Orifices	West Lake St and Garfield Ave	NO	N/A	N/A	SEH Model does not include orifice at Garfield Ave
	West Lake St and Harriet Ave	NO	N/A	N/A	SEH Model does not include orifice at Harriet Ave
	West Lake St and Grand Ave	NO	N/A	N/A	SEH Model does not include orifice at Grand Ave
	West Lake St and Pleasant Ave	NO	N/A	N/A	SEH Model does not include orifice at Pleasant Ave
	West Lake St and Pillsbury Ave	YES-MODIFIED FROM STUDY	Rectangular Orifice (Area - 0.75 ft^2)	LM14296-1	SEH Model includes orifice at Pillsbury Ave, SRF Study does not propose this
Storm Sewer Replacement[1]	From West Lake St and Blaisdell Ave to 31st St Dropshaft	NO	60-66 in RCP	Node M14368-Node M15022	2

1 Existing storm sewer within XPSWMM model is 33-42 inch RCP

2 SEH Model model matches SRF Study

Conclusion

The SEH model includes the majority of the features specified for the interim condition in the SRF study. The SEH Model incorporates the bypass overflow systems and all storm sewer upsizing proposed by SRF. There are some differences between the SRF Study, and the SEH model (see below).

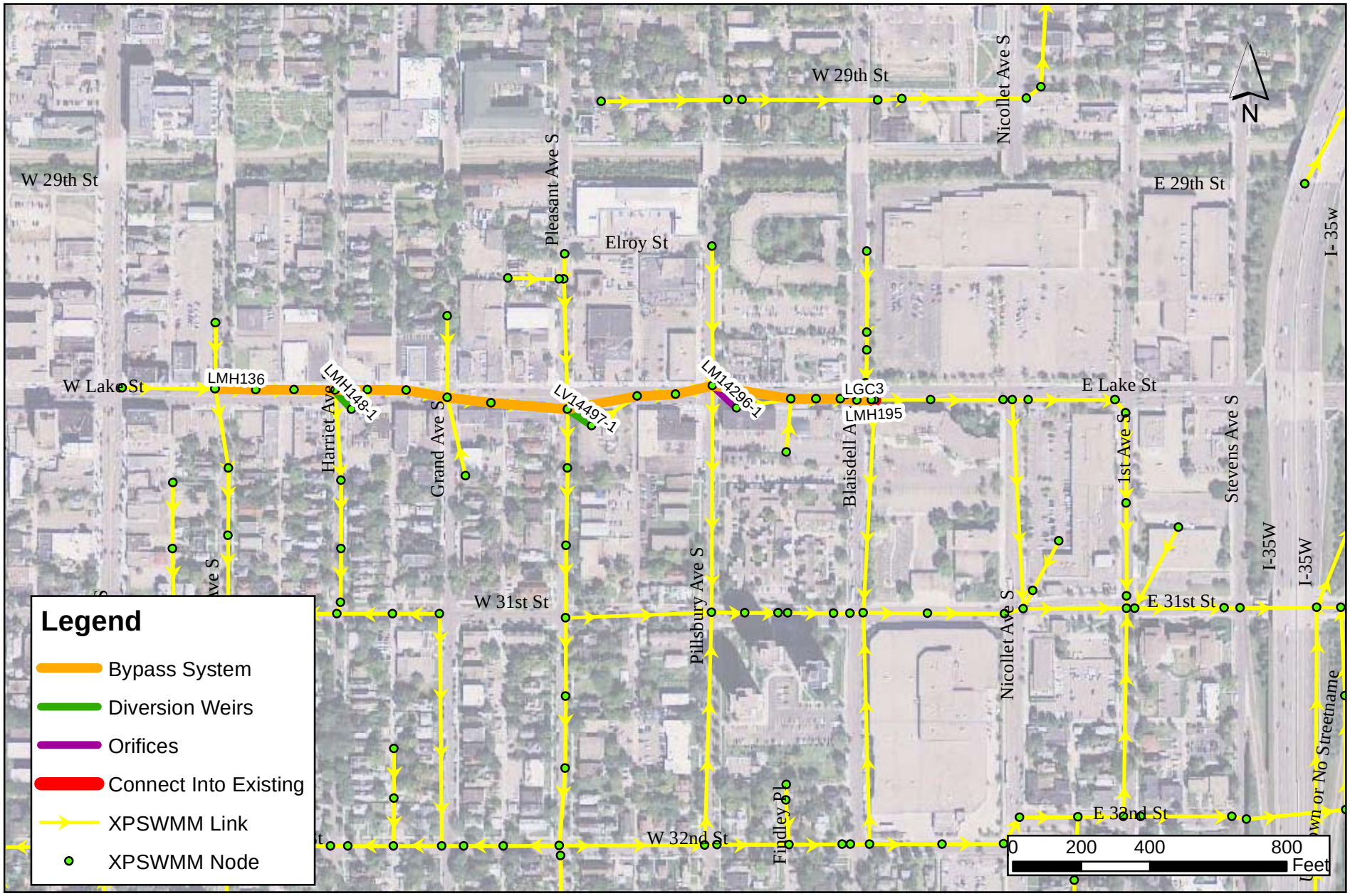
- Location of Diversion Weirs - The SRF Study specifies diversion weirs located at West Lake Street and Garfield, Harriet and Pleasant Avenue. The existing conditions XPSWMM model obtained from the City of Minneapolis is missing a diversion weir at Garfield Avenue.
- Location of Orifices - The SRF Study specifies 12-inch orifices located at West Lake Street and Garfield, Harriet, Grand and Pleasant Avenues. The existing conditions XPSWMM model obtained from the City of Minneapolis only contains one orifice located at Pillsbury Avenue.
- Size of Orifice- The SRF Study specifies a 12-inch orifice. Assuming this is 12-inches inner diameter for a round orifice, the assumed area is 0.79 sq-ft. The SEH Model includes a rectangular orifice with an area of 0.75 sq-ft.
- Location of Bypass System Connection into Existing- The SRF Study is unclear on the location of the bypass system's connection into existing. Within the Summary and Conclusions section, bullet 4 specifies the connection at Pillsbury Avenue, and bullet 5 at Blaisdell Avenue. The SEH Model has the bypass system connecting to existing at Blaisdell Avenue.

amh

Attachments

West Lake Storm Water Analysis – SRF Memo

Figure 1 – SEH Model Stormwater Feature Locations



Path: S:\FJH\Henne\113114\5-dsgn\50-WaterResources\GIS\Figures\West Lake Stormwater Analysis.mxd

SEH

3535 VADNAIS CENTER DR.
ST. PAUL, MN 55110
PHONE: (651) 490-2000
FAX: (651) 490-2150
WATTS: 800-325-2055
www.sehinc.com

Project: HENNC 113114
Print Date: 3/20/2014

Map by: ahaws
Projection: Lambert_Conformal_Conic
Source: CITY OF MINNEAPOLIS

SEH Model- Stormwater Feature Locations

I-35W Corridor Study
Minneapolis, MN

Figure 1

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.

SRF No. 0024421W

MEMORANDUM

TO: Jim Grube, P.E.
Hennepin County - Director, Transportation Dept. & County Engineer

Craig Twinem, P.E.
Hennepin County – Design Division Engineer

Don Elwood, P.E.
City of Minneapolis

FROM: David W. Filipiak, P.E., Principal
Troy R. Erickson, P.E., Senior Engineer

DATE: October 13, 2006

SUBJECT: WEST LAKE STREET STORM WATER ANALYSIS

PURPOSE

The intent of this memorandum is to document the process by which County State Aid Highway (CSAH) requirements have been attained for the West Lake Street Reconstruction Project. This process includes analysis of existing conditions, review of potential alternatives developed to meet CSAH requirements, and selection and analysis of a preferred alternative. Each portion of this process is described in the following.

BACKGROUND

West Lake Street (CSAH 3) is being reconstructed between Dupont Avenue South and Blaisdell Avenue South as part of Hennepin County Project Number 97-54. The storm sewer design and analysis effort, as well as the *I-35W Storm Tunnel Study* sponsored by the Minnesota Department of Transportation (Mn/DOT) and City of Minneapolis, indicates significant overland street flow within the reconstruction area for the design 10-year frequency rainfall event due to insufficient storm sewer capacity and relatively flat roadway profile. The addition of the proposed parking bays along West Lake Street will make surface flooding more apparent as storm water accumulates within the parking bays prior to being conveyed down the roadway.

As with other segments of the reconstruction project, it is the intent of the design to connect all storm sewer systems within the reconstructed roadway to the existing trunk storm sewer systems. County state aid highway design standards for storm water drainage along West Lake Street can not be attained using this approach. Storm water spread widths far exceed allowable limits for

the required design rainfall event. In essence, the roadway functions as the primary means of storm water conveyance.

The hydrologic and hydraulic storm water (XP-SWMM) model created for the *I-35W Storm Tunnel Study* was utilized for analysis of existing, interim and proposed conditions. The XP-SWMM model incorporates all storm sewer trunk lines within the City of Minneapolis that are tributary to the I-35W Storm Tunnel, as well as all potential street and overland flow routes. West Lake Street lies within two major subwatersheds of the I-35W Storm Tunnel: Subwatershed V and Subwatershed M. Both subwatersheds are shown in Figure 1. Subwatershed V generally drains to the south/southwest, discharges to a storm water basin located at the Minneapolis Park and Recreation Board King's Highway Facility and is then pumped back to the I-35W Storm Tunnel. West Lake Street slopes toward the east and directs excess runoff from Subwatershed V to Subwatershed M between Pleasant and Pillsbury Avenues, ultimately discharging to the I-35W Storm Tunnel at the 31st Street Dropshaft.

EXISTING CONDITIONS

The function of West Lake Street in response to a 10-year, 24-hour SCS Type II rainfall event was analyzed with the XP-SWMM model developed for the *I-35W Storm Tunnel Study*. This rainfall event was analyzed because CSAH design standards require that storm sewer be designed for an event of this magnitude, given the average daily traffic (ADT) of West Lake Street. Table 1 summarizes the existing drainage areas for each West Lake Street intersection and corresponding storm sewer system serving the intersection. In addition, Table 1 provides the XP-SWMM model results obtained for existing conditions along West Lake Street for each intersecting roadway. Figure 2 provides a detailed view of West Lake Street and connected storm sewer systems, as well as the contributing drainage area.

As indicated in Table 1, relatively large drainage areas deliver storm water runoff originating from fully developed areas to the defined intersections of West Lake Street. While storm water runoff from relatively large drainage areas is directed toward West Lake Street, the existing storm sewer systems are significantly undersized for the conveyance of 10-year storm water discharges. Given the physical characteristics of the existing storm sewer systems, the range of full flow capacities is 2.5 cfs to 6.8 cfs. Peak storm water runoff delivered to each West Lake Street intersection far exceeds the capacity of the storm sewer system as discharges range from 19.1 cfs to 27.7 cfs.

The existing storm sewer systems draining West Lake Street are only capable of conveying approximately 23- to 35-percent of the total storm water runoff delivered to each intersection. Because of the limited storm sewer capacity within the project area of West Lake Street, a significant amount of overland street flow occurs. Peak discharges within West Lake Street range from approximately 10 to 42 cfs. Most of the excess surface runoff flows down West Lake Street toward Pleasant Avenue. At this point, storm water is diverted from Subwatershed V to Subwatershed M. Once within Subwatershed M, excess surface runoff will flow overland until existing storm sewer capacity allows. The outlet of Subwatershed M is at the 31st Street Dropshaft of the I-35W Storm Tunnel.

ALTERNATIVE ANALYSIS

Three options were considered to reduce/alleviate flooding within the project area of West Lake Street. The three options considered include: (1) Increased Storm Water Conveyance Capacity, (2) Storm Water Storage/Attenuation and (3) Storm Water Diversion from Subwatershed V to M. Each option is discussed in the following.

Option 1, Increased Storm Water Conveyance Capacity, requires the upsizing of the storm sewer systems draining West Lake Street within Subwatershed V to the outlet located at the Minneapolis Park and Recreation Board King's Highway Facility, which houses a storm water storage basin and pumping facility. Complete replacement of the storm sewer is necessary because existing flooding is prevalent throughout Subwatershed V without the storm water runoff that is currently conveyed to the east via West Lake Street. Upgrades to the storm water storage basin and pumping facility and/or storm water diversions would also be necessary to compliment the upstream improvements.

Option 2, Storm Water Storage/Attenuation, requires the construction of four underground storage facilities at the intersections of West Lake Street and Garfield, Harriet, Grand, and Pleasant Avenues. The storage facilities would be located downstream of each intersection and designed such that storm water is gradually released as storm sewer capacity allows. Gravity storage facilities would extend the length of each block such that volume is maximized within the available right of way. Approximately four acre-feet of total storage is required between the four intersections to eliminate the conveyance of excess runoff via West Lake Street.

Option 3, Storm Water Diversion from Subwatershed V to M, perpetuates existing flow patterns, thereby providing storm sewer conveyance capacity for excess storm water that currently flows overland via West Lake Street between Subwatersheds V and M. In essence, the proposed storm sewer design will function as an overflow system. Existing storm sewers that drain southward via Garfield, Harriet and Pleasant Avenues from intersections with West Lake Street are utilized to the greatest extent possible. More frequent rainfall events producing storm water runoff are conveyed entirely by the existing storm sewer systems. Excess storm water is diverted to the overflow system that conveys storm water to the east via West Lake Street. This is accomplished by directing all storm water runoff to the front of a diversion weir set at an elevation equal to the crown elevation of the existing storm sewer at the previously specified intersections. Downstream improvements within Subwatershed M are necessary for conveyance of excess storm water.

All three options were examined on a preliminary basis with respect to cost, construction feasibility and potential hydraulic impacts to downstream storm water conveyance systems and attenuation facilities. Based on this analysis the third option, Storm Water Diversion from Subwatershed V to M, was determined to be the most feasible and, therefore, the preferred alternative.

PREFERRED ALTERNATIVE

The proposed West Lake Street storm sewer system will ultimately require upsizing of the downstream storm sewer to which it connects, including the I-35W Storm Tunnel. Figure 2 shows the proposed storm sewer system alignment. For the purposes of this project, the overflow system will be constructed from Garfield Avenue through Blaisdell Avenue and consists of 36- to 54-inch RCP. The overflow system will connect to an existing 24-inch RCP storm sewer running under West Lake Street by an 18-inch RCP. Beyond Blaisdell Avenue and, therefore the extents of this project, it is proposed that the existing storm sewer from the intersection of West Lake Street and Blaisdell Avenue be completely replaced to the 31st Street Dropshaft. Specifically, this will include: (1) all remaining storm sewer under West Lake Street from Blaisdell Avenue to First Avenue, (2) all existing storm sewer under First Avenue from West Lake Street to 31st Street and (3) all existing storm sewer under 31st Street from First Avenue to the 31st Street Dropshaft. The proposed storm sewer will be designed to convey 10-year discharges, eliminating all associated surface flooding. Therefore, it is proposed that existing storm sewer ranging from 24- to 42-inch RCP be replaced by 60- to 66-inch RCP. The downstream storm sewer replacement must coincide with improvements to the I-35W Storm Tunnel such that flooding issues within the I-35W freeway corridor are not exacerbated and maximum benefit is realized within the adjacent corridors of West Lake Street, First Avenue and 31st Street.

Upgrades to the existing storm sewer system downstream of the West Lake Street project boundary, i.e. downstream of Blaisdell Avenue South, are not expected to take place until well into the future. Therefore, special considerations must be made to maintain existing overland flow patterns within roadways intersecting West Lake Street during the interim. As designed, the West Lake Street overflow system will efficiently convey excess storm water to Blaisdell Avenue where conveyance to the existing storm sewer is limited by an 18-inch RCP. As a result, surface flooding is translated from west to east. In order to maintain existing overland flow patterns during the interim, 12-inch orifices designed to limit flow from the diversion will be placed within the overflow system at Garfield, Harriet, Grand and Pleasant Avenues. The plan should be referenced for specific details regarding the orifices.

PREFERRED ALTERNATIVE MODELING RESULTS

The West Lake Street overflow system was designed and analyzed using the XP-SWMM model developed for the *I-35W Storm Tunnel Study*. The results summarized in Table 2 should be referenced for comparison of surface and pipe conveyance along West Lake Street, First Avenue and 31st Street for existing, interim and ultimate conditions; the results summarized in Table 3 should be referenced for comparison of bypassed (south) flow from West Lake Street to the south for existing, interim and ultimate conditions. All results discussed in the following pertain to a 10-year, 24-hour SCS Type II distributed rainfall event.

Interim Conditions

Comparison of the XP-SWMM models developed for existing and interim conditions indicates a slight hydraulic improvement, but similar hydraulic characteristics are maintained throughout the conveyance system. Table 2 shows that surface conveyance depths decrease for all indicated intersections with exception of Blaisdell Avenue, which increased 0.06 feet. The increase in

surface conveyance depth at Blaisdell Avenue occurs because there is an increase in storm water volume delivered to this location by the overflow system. Some of the storm water delivered to this location was formerly conveyed to the south via overland flow by intersecting streets located west of Blaisdell Avenue. While seven locations exceed a flooding depth of 0.5 feet for the existing condition, only three locations exceeded this depth for the interim condition. The locations exceeding a flood depth of 0.5 feet include the intersections of West Lake Street and Harriet and Pleasant Avenues as well as the intersection of 31st Street and Blaisdell Avenue. As intended, surface conveyance rates for interim conditions closely match existing conditions. Only one surface conveyance rate is exceeded; Table 2 shows that a bypassed flow on Pleasant Avenue exceeds the existing condition by 0.6 cfs. Pipe conveyance for interim conditions closely matches existing conditions downstream of the West Lake Street overflow system as capacity remains unchanged. Negative discharges were reported at Grand Avenue and Pillsbury Avenue, indicating backflow from the south-draining storm sewer systems. Backflow occurs because the temporary storage provided by the overflow system allows the hydraulic head within West Lake Street to fall below those experienced downstream within Subwatershed V. Peak discharge to the I-35W Storm Tunnel was slightly reduced from 146 cfs to 141 cfs.

Ultimate Conditions

The results for ultimate conditions indicate that all surface flooding has been significantly reduced and/or eliminated along and adjacent to the corridor containing the proposed storm sewer system. Tables 2 and 3 show that all surface conveyance has been eliminated with exception of two locations that occur along 31st Street at Pillsbury and Blaisdell Avenues. These two intersections experience flooding because the storm sewer west of First Avenue along 31st Street was not upgraded. Due to the downstream improvements, however, flood depths at these two locations are reduced approximately 0.1 feet and fall below the curb height of 0.5 feet. As noted for the interim condition, Table 2 indicates backflow entering the West Lake Street overflow system from Garfield, Harriet and Pleasant Avenues. As a result, flooding downstream of West Lake Street is markedly reduced. This occurs because of the relatively flat topography adjacent to West Lake Street, as well as the added capacity of the overflow and downstream storm sewer system. Overall, peak discharge to the I-35W Storm Tunnel at the 31st Street Dropshaft increased from approximately 146 cfs to 269 cfs; this increase in peak discharge to the I-35W Storm Tunnel has a negligible effect on the corresponding hydraulics. For ultimate conditions, the I-35W Storm Tunnel was assumed to have an added 19-foot diameter tunnel originating at the 27th Street Dropshaft which runs parallel to the existing system before veering to the east at the intersection of TH 55 and I-94. At this approximate point the 19-foot diameter tunnel follows the alignment of and replaces the existing St. Mary's Storm Tunnel before discharging at the Mississippi River.

SUMMARY AND CONCLUSIONS

The following summary and conclusions are based on the analysis of existing, interim and proposed conditions:

- The existing trunk storm sewer systems serving this segment of West Lake Street is significantly undersized. Full pipe flow capacities range from 2.5 cfs to 6.8 cfs, while peak storm water discharges delivered to each intersection ranges from 19.1 cfs to 27.7 cfs. Peak surface discharges along West Lake Street continually increase from approximately 10 cfs to 42 cfs between Garfield and Pleasant Avenues, respectively.

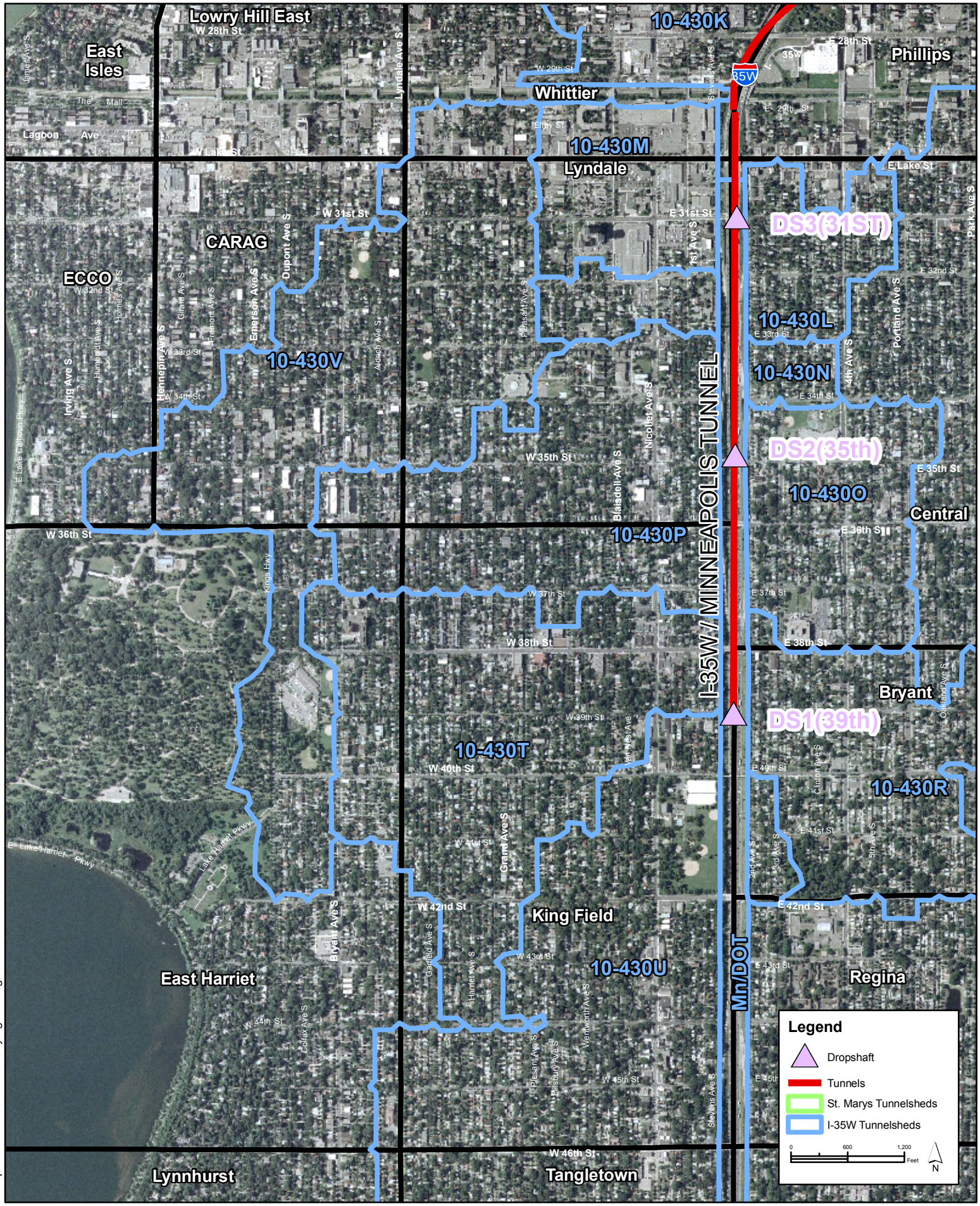
- CSAH design standards can not be attained utilizing the existing storm sewer system servicing West Lake Street. In addition, the construction of proposed parking bays along West Lake Street will make surface flooding more apparent as storm water will accumulate within the parking bays rather than be conveyed directly down the roadway.

- Three options were considered to reduce/alleviate flooding within the project area of West Lake Street. The three options considered are generally described as follows: (1) Increased Storm Water Conveyance Capacity within Subwatershed V, (2) Storm Water Storage/Attenuation within West Lake Street and (3) Storm Water Diversion from Subwatershed V to M. Option 3 was selected as the preferred alternative based on cost, constructability, and hydraulic performance considerations.

- Implementation of Option 3 allows existing flow patterns to be maintained for frequent rainfall events, directing storm water runoff originating from West Lake Street to the existing storm sewer systems located at Garfield, Harriet and Pleasant Avenues. Once the capacity of the existing storm sewer systems is exceeded, excess storm water runoff is directed by means of diversion weirs to an overflow system that perpetuates discharge from Subwatershed V to Subwatershed M. The overflow system is connected to existing storm sewer located at Pillsbury Avenue; the subwatershed boundary is located between Pleasant and Pillsbury Avenues. The diversion structures will be located at Garfield, Harriet and Pleasant Avenues.

- Ultimately, storm sewer improvements are necessary from the terminus of this project to the connection located at the 31st Street Dropshaft of the I-35W Storm Tunnel. However, the overflow system is proposed to be constructed far in advance of proposed downstream storm sewer improvements. Special considerations will be necessary to maintain existing overland flow patterns without exacerbating flood conditions in new locations. This is accomplished by restricting flow within the overflow system such that excess storm water discharges are distributed upstream of the connection to the existing storm sewer at Blaisdell Avenue.

- Increasing the storm sewer capacity downstream of the proposed overflow system to the 31st Street Dropshaft eliminates all flooding within the corridor of the proposed storm sewer and alleviates flooding in adjacent areas. Peak storm water discharges to the I-35W Storm Tunnel are increased; however, hydraulic impacts are negligible because of the assumed upgrade to the tunnel system for ultimate conditions.



J:\Maps\4976\mxd\TunnelStudyFigures\Fig1.mxd

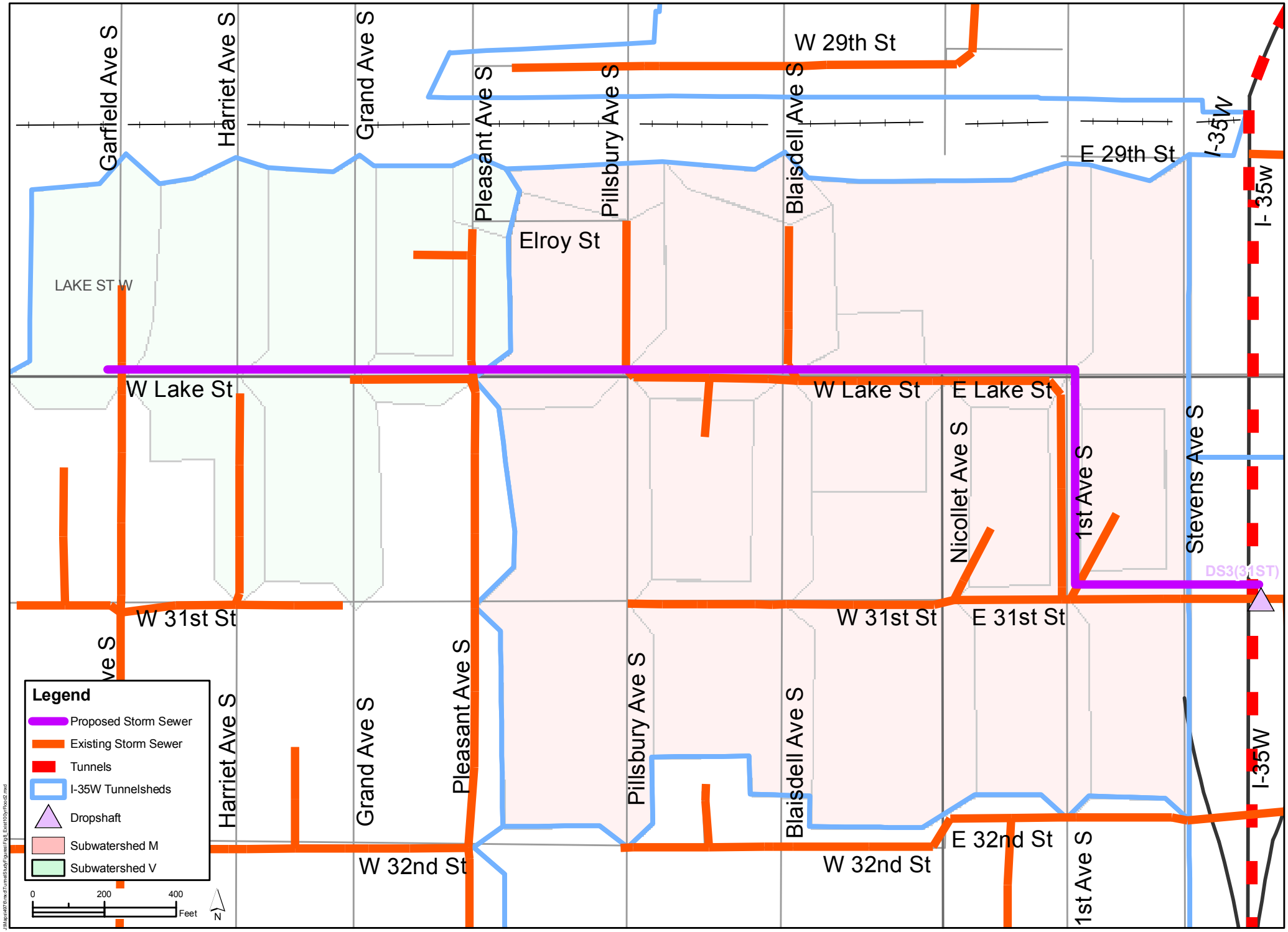
SRF Consulting Group, Inc.

I-35W STORM TUNNEL SUBWATERSHEDS

WEST LAKE STREET

00844906

Figure 1



SRF Consulting Group, Inc.

WEST LAKE STREET STORM SEWER SYSTEMS

WEST LAKE STREET

006 49 76 10/12/06

Figure 2

TABLE 1

10-YEAR HYDRAULIC RESULTS FOR WEST LAKE
BETWEEN GARFIELD AND AVENUES
HENNEPIN COUNTY
LAKE STREET - MINNEAPOLIS

INTERSECTION	DIRECT DRAINAGE AREA (ACRES)	DRAINAGE AREA Q_{TOTAL} (CFS)	PIPE		PIPE Q_{FULL}	PIPE $Q_{10\text{-}YR}$	LAKE ST. Q_{SURF}	% PIPE CONVEYANCE
			SIZE	SLOPE (%)				
GARFIELD AVENUE	4.9	20.1	15-INCH RCP	0.29	3.2	4.6	10.0	22.9
HARRIET AVENUE	7.1	22.9	15-INCH RCP	0.17	2.5	5.1	24.2	22.3
GRAND AVENUE	8.4	19.1	18-INCH RCP	0.37	5.9	6.1	37.2	31.9
PLEASANT AVENUE	5.6	27.7	21-INCH RCP	0.21	6.8	9.7	42.1	35.0

This Page Left Blank Intentionally

TABLE 2

PRELIMINARY XP-SWMM 10-YEAR MODEL RESULTS
WEST LAKE STREET HYDRAULIC ANALYSIS SUMMARY

HENNEPIN COUNTY
LAKE STREET - MINNEAPOLIS

		EXISTING CONDITIONS			INTERIM CONDITIONS				ULTIMATE CONDITIONS			
PRIMARY ROADWAY	INTERSECTION	SURFACE CONVEYANCE DEPTH[1] (FEET)	PIPE CONVEYANCE (CFS)	SURFACE CONVEYANCE (CFS)	SURFACE CONVEYANCE DEPTH (FEET)	PIPE CONVEYANCE (CFS)	SURFACE CONVEYANCE (CFS)	SURFACE CONVEYANCE DEPTH INCREASE/DECREASE[3] (FEET)	SURFACE CONVEYANCE DEPTH (FEET)	PIPE CONVEYANCE (CFS)	SURFACE CONVEYANCE (CFS)	SURFACE CONVEYANCE DEPTH INCREASE/DECREASE[3] (FEET)
WEST LAKE STREET	GARFIELD AVENUE	0.33	N.A.	10.01	0.30	3.07	8.15	-0.03	-1.92	18.91	0.00	-2.25
	HARRIET AVENUE	0.62	N.A.	24.23	0.59	8.37	21.43	-0.03	-1.50	40.32	0.00	-2.12
	GRAND AVENUE	0.50	6.09	37.17	0.45	-10.12 / 6.09	29.37	-0.05	-2.31	56.53 / 5.96	0.00	-2.81
	PLEASANT AVENUE	0.70	N.A.	42.11	0.64	13.19	32.10	-0.06	-1.46	80.65	0.00	-2.16
	PILLSBURY AVENUE	0.40	13.85	12.77	0.32	-15.98 / 13.94	7.64	-0.08	-2.41	85.23 / 11.62	0.00	-2.81
	BLAISDELL AVENUE	0.18	31.24	3.00	0.24	30.74	2.03	0.06	-1.99	111.55	0.00	-2.17
	NICOLLET AVENUE	0.24	32.28	5.50	0.18	32.32	2.67	-0.06	-2.55	122.08	0.00	-2.79
FIRST AVENUE	WEST LAKE STREET	0.53	40.72	33.81	0.48	39.34	26.78	-0.05	-2.57	148.35	0.00	-3.10
WEST 31ST STREET	PLEASANT AVENUE	-0.97	N.A.	0.00	-1.10	N.A.	0.00	-0.13	-1.39	N.A.	0.00	-0.42
	PILLSBURY AVENUE	0.54	16.33	37.34	0.47	16.42	25.57	-0.07	0.46	16.20	24.39	-0.08
	BLAISDELL AVENUE	0.58	40.09	44.37	0.54	39.38	36.41	-0.04	0.47	46.97	24.11	-0.11
	NICOLLET AVENUE	0.47	56.40	41.95	0.43	54.46	33.58	-0.04	-0.32	75.69	0.00	-0.79
	FIRST AVENUE	0.51	113.57	48.66	0.33	113.33	16.76	-0.18	-4.28	239.61	0.00	-4.79
	STEVENS AVENUE	-5.38	146.40	0.00	-5.59	140.57	0.00	-0.21	-6.03	269.04	0.00	-0.65

[1] NEGATIVE FLOOD DEPTHS INDICATE DEPTH BELOW STRUCTURE TOP OF STRUCTURE CASTING.
[2] SHADED CELLS INDICATE SURFACE CONVEYANCE DEPTHS GREATER THAN 0.5 FOOT CURB HEIGHT.
[3] NEGATIVE VALUES INDICATE A DECREASE IN SURFACE CONVEYANCE DEPTH.

This Page Left Blank Intentionally

TABLE 3

PRELIMINARY XP-SWMM 10-YEAR MODEL RESULTS
WEST LAKE STREET SOUTH BYPASSED FLOW SUMMARY

HENNEPIN COUNTY
LAKE STREET - MINNEAPOLIS

	EXISTING CONDITIONS		INTERIM CONDITIONS		ULTIMATE CONDITIONS	
ROADWAY INTERSECTING WEST LAKE STREET	PIPE CONVEYANCE (CFS)	SURFACE CONVEYANCE (CFS)	PIPE CONVEYANCE (CFS)	SURFACE CONVEYANCE (CFS)	PIPE CONVEYANCE (CFS)	SURFACE CONVEYANCE (CFS)
GARFIELD AVENUE	4.6	5.5	4.2	4.4	-4.9	0.0
HARRIET AVENUE	5.1	3.6	3.9	3.2	-4.3	0.0
GRAND AVENUE	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
PLEASANT AVENUE	9.7	13.1	7.3	13.7	-9.6	0.0
PILLSBURY AVENUE	N.A.	22.7	N.A.	13.9	N.A.	0.0
BLAISDELL AVENUE	N.A.	3.1	N.A.	2.1	N.A.	0.0
NICOLLET AVENUE	N.A.	7.4	N.A.	4.0	N.A.	0.0
FIRST AVENUE	40.7	33.8	39.3	26.8	148.4	0.0

[1] POSITIVE DISCHARGE VALUES INDICATE FLOW TO THE SOUTH.

MINNESOTA DEPARTMENT OF TRANSPORTATION
Engineering Services Division
Technical Memorandum No. 11-14-B-05
September 7, 2011

To: Electronic Distribution Recipients

From: Jon M. Chiglo, P.E.
Division Director, Engineering Services

Subject: Storm Drain Design Frequency and Catch Basin Spacing

Expiration
This Technical memorandum supersedes Technical Memorandum 06-26-B-02 and will expire on September 7, 2016 unless superseded or placed into the MnDOT Drainage Manual prior to that date.

Implementation
The provisions of this Technical Memorandum should be incorporated into the design of trunk highway storm drain systems not yet started.

Introduction
Storm drain design frequency and catch basin spacing criteria are used in the design of storm drain systems. Questions regarding interpretation of the policy provided in the August 2000 edition of the MnDOT Drainage Manual are intended to be addressed by this Technical Memorandum.

Purpose
This Technical memorandum is intended to clarify policy relating to design frequency and spacing of catch basins for storm drain systems contained in the August 2000 edition of the MnDOT Drainage Manual.

Guidelines
The minimum design frequency for storm drains and the allowable spread of water onto the roadway shall be in accordance with the following criteria. Additional inlets may be necessary, see MnDOT Drainage Manual sections 8.2.1 and 8.7.2

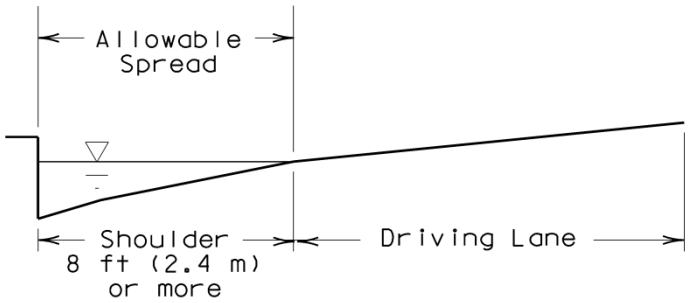
HIGHWAY MAINLINE
DESIGN FREQUENCY FOR STORM DRAINS

PROJECTED 2-WAY ADT (vehicles/day)	DESIGN FREQUENCY	DESIGN SPEED	ALLOWABLE SPREAD[1]
Interstate	10 year 50 Year at Major Sag Point[2]		S S
Trunk Highway 5000 and Greater	10 Year 10 Year 50 Year at Major Sag Point[2]	**45 mph** (70 km/h) or more Less than **45 mph** (70 km/h)	S or 1/3 D S or 1/2 D S and 1/2 D
Trunk Highway 1000 to 4,999	5 Year 5 Year	**45 mph** (70 km/h) or more Less than **45 mph** (70 km/h)	S or 1/3 D S or 1/2 D
Trunk Highway 0 to 999	3 Year 3 Year	**45 mph** (70 km/h) or more Less than **45 mph** (70 km/h)	S or 1/3 D S or 1/2 D

[1] S = Shoulder of **8 ft** (2.4 m) or greater, D = Driving lane
[2] Major Sag Point refers to a true sag where flooding of **2 ft** (0.6 m) or more can occur.

-MORE-

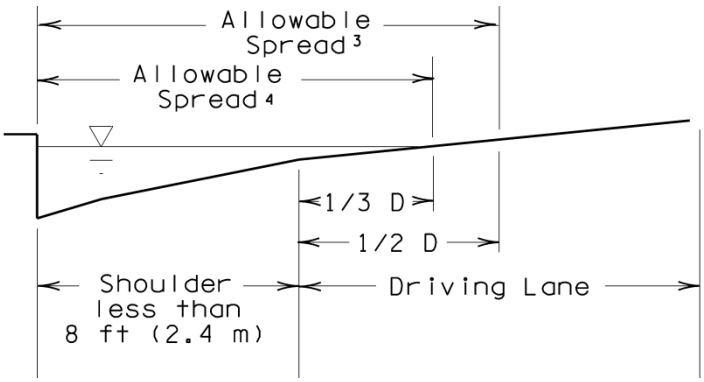
No Spread Allowed on Driving Lane
Allowable spread for shoulder width **8 ft** (2.4 m) or more



Spread Allowed on Driving Lane
Allowable spread for shoulder width less than **8 ft** (2.4 m)

[3] For Design Speed less than **45 mph** (70 km/h)

[4] For Design Speed **45 mph** (70 km/h) or more



Shoulder
The shoulder width is the distance from the edge of the travel lane to the face of the curb.

Trunk Highway Turn Lanes
Design Frequency –Same as for mainline
Allowable Spread – 1/2 lane width

Trunk Highway and Interstate Ramps and Loops
Design Frequency – Same as for mainline
Allowable Spread – 1/2 roadway width

Collector/Distributor and Auxiliary Lanes
Design Frequency – Same as for mainline
Allowable Spread – Shoulder (if 8 foot wide or greater) or 1/3 the lane width

Local Streets and Frontage Roads
Design Frequency and Allowable Spread – Use criteria as shown in State Aid Manual 5-892.600 if the road is on State Aid System; otherwise use criteria established by the local road authority.

Roundabouts
Design Frequency – Same as connecting roadway with highest ADT
Allowable Spread – ½ lane width

Additional inlets may be needed to limit run-by across connecting roadways.

Sag Points
A major sag point refers to a true sag where flooding of **2 ft** (0.6 m) or more can occur.

For sag points on trunk highways with ADT < 5000 vehicles per day, and for all local roads, consideration should be given to designing sag points at critical locations for a higher frequency in order to limit water ponding to a depth less than **2 ft** (0.6 m) on roads that are otherwise passable.

For all sag points, it is recommended that curb inlets or combination grate/curb openings be utilized. If a grate alone is used at sag point, consideration should be given to assuming a portion of the grate to be clogged by debris. A reasonable assumption is to assume that the grate is half clogged with debris.

Storm drains should be designed to take into consideration potential damage to adjacent properties.

Questions
For information on the technical contents of this memorandum, please contact Andrea Hendrickson, State Hydraulics Engineer, Bridge Office at **(651) 366-4466**.

Any questions regarding publication of this Technical Memorandum should be referred to the Design Standards unit, DesignStandards.DOT@state.mn.us. A link to all active and historical Technical Memoranda can be found at http://techmemos.dot.state.mn.us/techmemo.aspx.

To add, remove, or change your name on the Technical Memoranda mailing list, please visit the web page http://techmemos.dot.state.mn.us/subscribe.aspx

-END-

FILE 4702
"Correspondence"

Minnesota Department of Transportation

Metropolitan District
Waters Edge
1500 West County Road B-2
Roseville MN 55113-3174

OCT 2005

Don D ✓
Dave F ✓
Lisa G ✓
then file
SHIELA ✓
log ✓

September 29, 2005

Mr. Tom Sorel
Division Administrator
Federal Highway Administration
Galtier Plaza
380 Jackson Street, Suite 500
St. Paul, MN 55101-2904

FHWA – TUNNEL STUDY, WATER RESOURCES COMMENTS

SUBJECT: I-35W & Crosstown Commons Project

Dear Mr. Sorel:

Lieutenant Governor Molnau has asked the Metro District to respond to Tim Anderson's letter dated July 8, 2005 in regards to the I-35W / TH 62 reconstruction project. Below are Mn/DOT's responses to each of the issues that Tim has raised in his letter to the Lieutenant Governor.

In the second paragraph, Tim stated FHWA's concerns with the current project not meeting FHWA's design policy for a 5-year event at 42nd Street and a 10-year event at 46th Street. As we have stated and acknowledged in several meetings with FHWA representatives, the current design proposed is sized to adequately handle the water from storm events based on FHWA's design policies within the project limits. Hydraulic problems associated with the storm tunnel downstream of the project area influence the hydraulics south of 39th Street backing water into the project area. Recognizing these problems, Mn/DOT and the City of Minneapolis have jointly funded an extensive study to understand the flow in the tunnel. We know that a free outfall condition downstream of the project area does not exist, which would allow the proposed system to perform as designed. In fact, surcharging occurs causing water north of the project to flow south, or backflow into the Crosstown project. Most of the data that we have supplied to FHWA are preliminary results from this study. Further, one of the final deliverables of the study is to identify solutions to the tunnel flow problems. At the time of this letter, two alternatives are being considered for further evaluation. 1) A storage cavern sized to store a significant amount of water that backflows into the project area. 2) A parallel tunnel starting at 28th Street running to the Mississippi River.

It is Mn/DOT's intention to jointly fund one of these alternatives with the City of Minneapolis. It is our understanding that the city currently has identified funding in their CIP at a level they have assumed for their share of a parallel tunnel. Mn/DOT has as part of the estimate for the I-35W Improvement Project north of 42nd Street included a tunnel solution (the most expensive alternative) to address the hydraulics problems associated with the existing tunnel which lies within the project limits identified with this new project. The I-35W Improvement Project is in our Work Study Plan but is not fully funded at this time. Upon completion of the joint I-35W Tunnel Study, Mn/DOT will forward a copy of the report to your office.

FHWA has requested a history of the flooding events on the section of I-35W between 40th Street and Minnehaha Creek. I have attached several e-mails and RTMC log entries that indicate possible flooding. Mn/DOT does not have complete records on the history in regards to the tunnels backflow onto the freeway at 46th Street and at 42nd Street. A Mn/DOT representative at one of our meetings gave the indication that we had extensive maintenance records documenting these occurrences. I have not been able to track down any more than what is attached. Since our meetings I have asked for any flood related incidents associated with rainfall events that have occurred this summer on I-35W. While a few of the events have caused geysering at the 35th Street dropshaft, there has been no documented flooding at 46th Street and at 42nd Street. As part of the I-35W / TH 62 Reconstruction project we are placing 2 surge chambers at 35th Street and at 39th Street where geyser effects have been occurring.

There is a history of flooding events that have occurred at Diamond Lake Road. This area does not flow into the storm tunnel. The proposed hydraulic design for the Crosstown Reconstruction Project south of Minnehaha Creek corrects the flooding problems at Diamond Lake Road and meets FHWA design policy criteria.

To address bullet number two, the hydraulic model that was run assuming a free-flow outfall indicates that the design is in compliance with FHWA's design policy. With this result, one could conclude that the elimination of the surrounding drainage area, which accounts for over 90% of the water coming into the tunnel, would only improve the results. The Tunnel Study is a more detailed study that confirmed work done in the mid 1990's by a different consultant that did not assess the affects of the Minneapolis storm sewer on the system. It is our opinion that the Tunnel Study does not require an independent review of the work performed by our Design Consultant, SRF, as they currently have more knowledge and understand the dynamics of this entire system than anyone. An independent review would be expensive and very time consuming with results that are likely to be similar to what SRF has found.

At this time the storage cavern has not been fully designed. Depending on different volumes of storage needed based on flow, an approximate size has been calculated. If the results of the Tunnel Study suggests more detailed analysis of a storage cavern Mn/DOT will forward all design elements to FHWA for their review.

The 42nd Street overpass was studied and it was found that it could be raised approximately 4' using a number of expensive retaining walls. The hydraulic model was modified to reflect the low point condition. The model results indicated that because the flooding is affected by the tunnel tailwater, the depth of water in the sag point was only slightly decreased, as the water surface increased to utilize available storage. The minor decrease in depth of flooding did not justify the additional expense to raise the roadway or the additional impacts to the surrounding areas. Grade raises at 42nd Street would also cause additional 4f impacts to Martin Luther King Park.

I would like to reiterate Mn/DOT's position on the impacts of the tunnel hydraulics backflowing into the Crosstown project area. Mn/DOT does intend to jointly fund with the City of Minneapolis, one of the solutions identified in the Tunnel Study, with our I-35W Improvement Project north of 42nd Street.

Based on the preliminary results from the Tunnel Study, (attached documentation), the proposed I-35W /TH 62 Reconstruction project does not significantly affect the flooding condition that exists today based on the modeling. As you are aware, the dynamics of the tunnel play an active part in the hydraulic situation that occurs in this corridor and will be addressed with a joint project with the City of Minneapolis.

With this formal response, Mn/DOT proposes to move forward with the current hydraulic design. Mn/DOT will continue to evaluate alternatives identified in the Tunnel Study and share the results with FHWA. It is our intention to implement the solution as part of the project north of 42nd Street where the tunnel begins at 39th Street. If you have further comments or concerns regarding this matter, please contact John Griffith, Project Manager for the Crosstown Reconstruction Project at (651) 582-1206.

Sincerely,

Patrick C. Hughes, P. E.
District Engineer

cc: Lt. Governor Carol Molnau, Mn/DOT
John Griffith, Mn/DOT
Thomas O'Keefe, Mn/DOT
Rick Brown, SRF Consulting Group, Inc
Timothy Anderson, FHWA

(Enclosures)

Attachments

U.S. Department of Transportation
Federal Highway Administration
Minnesota Division
Phone (651) 291-6100

Galtier Plaza
380 Jackson Street, Suite 500
St. Paul, Minnesota 55101-2904
Fax (651) 291-6000

July 8, 2005

The Honorable Carol Molnau
Lt. Governor
Department of Transportation
MS 100, Transportation Building
St. Paul, Minnesota 55155

Re: I-35W & TH-62 Cross-town Commons Project

Dear Ms. Molnau:

Enclosed for your consideration is a report prepared by Dan Ghere, Hydraulic Engineer from our Midwest Resource Center as a result of a January 7, 2005, meeting with members of your Metro District, and SRF Consulting Group, Inc. concerning various critical hydraulic design issues on the upcoming TH-62/I-35W project. A draft copy of the report was previously provided informally in March of this year to Metro District.

The principle issue concerns the subject project and the FHWA design policy requiring interstate highway traveled lanes to remain water free during a 50-year storm. The storm sewer hydraulic dynamics north of Mn/DOT's proposed project area cause roadway inundation back into the project area during a 5-year storm at 42nd Street and at a 10-year storm at 46th Street. It is our understanding that the existing tunnel design and surrounding drainage area outside of the interstate corridor greatly influence this area and that the current hydraulic design for the I-35W /TH-62 project meets the 50-year storm design frequency when free flow conditions are modeled in the tunnel. It is also our understanding that Mn/DOT has developed concepts that potentially satisfy the FHWA design policy and they are being pursued as a result of discussions during the meeting. It is further understood that these or other concepts will be implemented prior to any further expansion of I-35W north of this project.

As noted in the report, the following recommendation and request for information are provided:

- The history of flooding on the section of I-35W between 40th street and Minnehaha Creek is essential in evaluating alternative solutions to anticipate flooding on this project based on modeling, and we are requesting that this information be submitted for our review.

- Due the nature of this very complex hydraulic issue, we recommend that consideration be given towards conducting a hydraulic evaluation of this section of I-35W taking only the needs of the interstate into consideration (absent the needs of the surrounding area). While it is good to recognize the needs of the surrounding area, it is essential to understand the difference between the two in terms of cost and scheduling. This evaluation should not be construed as second guessing the work that has already been done by SRF, but merely to confirm such work.

- We request that details of the storage cavern noted in the report (plan view, elevation view, and cross section) and details demonstrating cost to build for a flood free interstate based on a 50-year frequency design storm event be submitted for our review.

- We request that the results of the evaluation of alternatives that include a grade raise at 42nd street, noted in the report, be submitted for our review. All evaluations must address the 5, 10, and 50-year frequency storm events.

It is our hope that additional designs that help satisfy the FHWA hydraulic design policy will be incorporated into this project. However, in the event that Mn/DOT proposes to proceed with substandard hydraulic features on this project, a formal request for a design exception must be submitted for our review and approval. Such a design exception must include a Mn/DOT commitment and action plan to mitigate any adverse consequences of substandard hydraulic design features as well as assurance that all substandard hydraulic design issues on this project will be resolved in a timely fashion.

A formal response to the recommendation noted above, as well as submission of requested information including a design exception request (if applicable) by the end of July, is greatly appreciated.

Sincerely yours,

Timothy J. Anderson, PE
Highway Engineer

Enclosure

Federal Highway Administration
Resource Center
Fieldtrip Report

Purpose: Attend Meeting on I-35W with Minnesota Division and Mn/DOT	
To: Tom Sorel	**From:** Dan Ghere
Date(s) of travel: Jan. 7, 2005	**Location:** Minneapolis, MN
Primary Contacts: Tom O'Keefe, John Griffith, Bruce Irish, Val Svensson, and Andrea Hendrickson of Mn/DOT; David Filipiak, Don Demers, and Walter Eshenaur of SRF Consulting Group, Inc.; Romeo Garcia, FHWA Minnesota Division and Dan Ghere, FHWA Resource Center.	

Executive Summary

A meeting was held in the Mn/DOT Metro District office at 10:00 am on January 7, 2005 to discuss the I-35W storm drain design alternatives being evaluated by SRF Consulting Group for Mn/DOT. SRF Consulting Group presented the results of their SWIMM model study results for existing conditions and for the proposed condition that includes a larger storm drain outletting to the 39th street drop shaft. Several handouts were provided that illustrated the hydraulic gradeline for the 2, 5, 10, 50, and 100 year frequency storms and the resultant pavement flooding of both I-35W and city streets. The primary focus of the meeting was on alternate designs that would eliminate or reduce the pavement flooding conditions of I-35W at 42nd St and 46th St.

The only alternative presented that would eliminate the flooding condition involved the construction of a storage cavern at a cost of approximately 8 to 10 million dollars, based on a 100 year storm event and 21 acre feet of storage volume. The volume of storage needed to satisfy a 50 year frequency storm event was not presented but should be determined to address the design policy requirements for Interstate Highways. No specific details of the cavern design were available for review at this time. Construction of a parallel tunnel system at a cost of $40 million plus (depending on location selected) was also discussed along with the possibility of participation by the city of Minneapolis in the cost of this system. The parallel tunnel system would not be a part of the current project but would be a considered alternative in the next project phase that is expected to be about three years behind this project. Mn/DOT and SRF representatives both raised the question of the wisdom of spending 8 to 10 million dollars on the cavern storage when the northerly project extension could solve the storage problem within 3 years of the construction of the caverns (assuming the parallel tunnel system were included as part of the northerly project). FHWA representatives agreed as long as there was some assurance that the tunnel system would indeed be included in the next phase of this project.

The possibility of raising the roadway profile at 42nd St was discussed and Mn/DOT advised that the necessary grade raise of 5.5 feet that would be required to eliminate any pavement flooding would require additional right-of-way and would adversely impact adjacent residential properties. The greatest profile raise that could be accommodated within existing right-of-way is 3.5 feet. Walter Eshenaur of SRF indicated that the effects of a 3.5 foot grade raise were evaluated for a 100 year storm and that while this resulted in a reduction in depth of ponding it did result in a slight increase in the hydraulic gradeline elevation at 42nd Street. Dan Ghere asked SRF if they would evaluate this condition for the 5, 10, and 50 year frequency storms to determine if a 3.5 foot grade raise would eliminate or improve flooding conditions for the more frequent storm events. Again there is no requirement to design for a 100 year frequency storm event.

Romeo reminded Mn/DOT and SRF that since they have identified a viable alternative that would eliminate the flooding of I-35W (i.e. construction of a storage cavern) that if they chose to proceed with any other alternative they must provide justification that includes costs and reasoning for selecting an

alternative that does not satisfy interstate policy that calls for a flood-free roadway at a 50 year storm event.

Future Actions or Follow-up

SRF and MNDOT will proceed with the evaluation of alternatives that include a grade raise at 42nd St, construction of a storage cavern along I 35W, and enlargement of the I 35W storm drain. Construction of a parallel tunnel may also be included in the alternatives considered if it appears that a funding commitment can be obtained. All evaluations must specifically address the 50 year frequency storm event as noted above.

Recommendations for Division Office

The following recommendations were not specifically discussed at the meeting but are presented at this time for consideration by the Division office.

- In order to properly document and confirm major decisions made on hydraulic issues on this project, it is recommended that formal correspondence on this subject be initiated with Mn/DOT.
- The history of flooding on the section of I 35W between 40th street and Diamond Lake is essential in evaluating alternative solutions to anticipated flooding on this project, and it is therefore recommended that Mn/DOT be requested to submit this information.
- A dialog should be opened up with Mn/DOT to evaluate the need to obtain an independent hydraulic evaluation of this section of I 35W. This evaluation should only take the needs of the interstate into consideration (absent the needs of the surrounding area). While it is good to recognize the needs of the surrounding area, it is essential to understand the difference between the two in terms of cost and scheduling. This evaluation should not be construed as second guessing the work that has already been done by SRF, but merely to confirm such work. An independent evaluation is deemed wise considering the magnitude of the hydraulic issue at hand.
- Mn/DOT should be requested to submit details of the storage cavern noted above (plan view, elevation view, and cross section) and details demonstrating cost to build for a flood free interstate based on a 50 year frequency design storm event.
- Mn/DOT should be requested to submit the results of the evaluation of alternatives that include a grade raise at 42nd street noted above. All evaluations must address the 5, 10, and 50 year frequency storm events.
- An additional meeting to provide updated information and results of additional work should be scheduled with Mn/DOT within the next few months if possible.

Distribution

To: Minnesota Division – Tom Sorel, Robin Schroeder, Stan Graczyk, Romeo Garcia;
FHWA Resource Center – Peter Osborn, Larry Arneson, Marlene Eichner;
FHWA Headquarters – Jorge Pagan;

Tunnel Hydraulics

The segment of I-35W north of Minnehaha Creek drains via storm sewer north to a tunnel system that begins at 39th Street South and flows north, through the I-35W/I94 commons area, and discharges to the Mississippi River below St Anthony Falls. The 12 to 14 foot tunnel was constructed in the 1960's, and is located up to 100 feet deep in a layer of sandstone lying beneath a layer of limestone. The tunnel drains approximately 5 square miles of south Minneapolis which includes a portion of both I-35W and I-94, a significant amount of residential area, and a portion of the downtown area. The highway portion of the drainage area is roughly 5 percent of the overall area.

The tunnel was designed to carry runoff from the 5-year storm under full flow, with larger storms surcharging the system. The system has shown signs of under capacity over the years in a number of ways. First, there has been flooding in the low point area of I-35W at 46th Street that has required maintenance. It is unclear from the maintenance records if the flooding was due to clogged grates or pipe capacity. Second, Mn/DOT has performed a study of a geysering issue at the 35th Street dropshaft since the mid 1990's. The drop shaft at this location has seen geysers occur during intense rainfall events, which send a combination of water and air up the shaft. Other data collected during these events suggest that the geysers consist of more compressed air than water, partially the result of water flowing from the north to south, or 'uphill', in the tunnel during initial filling.

Further hydrologic and hydraulic modeling has taken place in the past year to better assess the tunnel capacity and identify potential solutions. Mn/DOT and the City of Minneapolis jointly funded a study to model the tunnel and storm sewer network in XP-SWMM, which included assembly of an extensive existing conditions model, and a proposed model which included proposed changes within the I-35W corridor. The results suggest that the tunnel is significantly undersized for current city and state design standards. A review of the models indicates the following:

- Filling of the tunnel occurs first in the vicinity of Lake Street and flows in both directions within the tunnel.
- Models show that flooding is predicted to occur at the 46th Street and 42nd Street low points in the existing conditions for storm events greater than the 5-year event. (see attached table)
- The model predicts the low points will take approximately 0.5 to 2.5 hours to drain for the 5-year to the 100-year storm respectively. (see attached table)
- Considerable flooding occurs in the municipal areas, in large part due to the existing undersized storm sewer network.
- Flooding in the two low points is nominally increased in the proposed condition.

A number of design elements within the current project were explored to lessen the flooding in the corridor.

- Raise the I-35W low points. The sag points at 42nd and 46th Streets were studied to determine how much the bridge and adjoining roads could be raised without impacting

additional right-of-way. The 42nd Street overpass was studied in detail and found to that it could be raised approximately four feet using a number of retaining walls. The model was then changed to emulate the raised low point condition. The model results indicate that because the flooding is affected by the tunnel tailwater, the depth of water in the sag point was only slightly decreased, as the water surface increased to utilize available storage. The minor decrease in depth of flooding did not justify the additional expense to raise the roadway or the additional impact to the surrounding areas.

- Inline storage within the conveyance system (oversized pipes/underground storage). This option was considered and found to not impact flooding due to the shear volume of water in the system.

The proposed design incorporates a phased approach to addressing the issue.

1. Design the system being constructed under the current project (Minnehaha Creek north to 42nd Street) using the current Mn/DOT standards (10-year full flow pipe design, 50-year design at the low points), assuming free outfall into the 39th Street drop shaft.
2. Incorporate one of the tunnel solutions in the next I-35W project, or prior to its construction. Solutions include underground, off-line storage (caverns) or a parallel tunnel.
3. Incorporate the capacity for the local connections as requested by the City of Minneapolis, using flow restrictors until a final tunnel solution is constructed.

35W Tunnel Study - XPSWMM Model Results
Analysis of 42nd and 46th St. Low Points - Proposed Conditions
100-year/24-hour Type II Storm Event
January, 2005

Event/Rainfall (yr/inches)	Allowable Flood Depth (ft) [1]	Water Surface Elevation (ft)	Depth of Flooding (ft)	Flood Duration (min)
42nd St. Low Point				
2 (2.8")	822.7	814.6	0	0
5 (3.5")	822.7	824.7	2.0	30
10 (4.2")	822.7	827.1	4.5	87
50 (5.3")	822.7	828.5	5.8	130
100 (5.9")	822.7	829.1	6.4	155
46th Street Low Point				
2 (2.8")	829.7	822.1	0	0
5 (3.5")	829.7	829.4	0	0
10 (4.2")	829.7	830.4	0.7	37
50 (5.3")	829.7	831.5	1.8	107
100 (5.9")	829.7	832.1	2.4	133

[1] Allowable flood depth is defined as the low point elevation at the edge of the drive lane.

35W Tunnel Study - XPSWMM Model Results
Summary of Existing and Proposed Conditions Effects on Selected Mpls Storm Sewer Systems
100-year/24-hour Type II Storm Event
January, 2005

Location		Summary of Existing Conditions				Summary of Interim Conditions (Crosstown improvements only)					Summary of Ultimate Conditions (includes larger storm sewer to 39th drop shaft)				
		Model Results				Model Results			Difference (interim - existing)		Model Results			Difference (ultimate - existing)	
	Direction from 35W Tunnel	Node #	Ground Elevation (ft)	Max Water Level (ft)	Freeboard (ft)	Ground Elevation (ft)	Max Water Level (ft)	Freeboard (ft)	Ground Elevation (ft)	Max Water Level (ft)	Ground Elevation (ft)	Max Water Level (ft)	Freeboard (ft)	Ground Elevation (ft)	Max Water Level (ft)
47th St. conn to 35W trunk		*47TH*	*839.0*	*839.5*	*-0.5*	*839.0*	*839.5*	*-0.5*	*0.0*	*0.0*	*840.3*	*840.5*	*-0.2*	*1.3*	*1.1*
SB Ramp frm 46th to 35W	*west*	*U25857*	*853.9*	*849.7*	*4.2*	*853.9*	*849.7*	*4.3*	*0.0*	*0.0*	*853.9*	*853.9*	*0.0*	*0.0*	*4.3*
Stevens Ave	west	U25863	859.3	859.2	0.2	859.3	859.1	0.2	0.0	0.0	859.3	859.6	-0.3	0.0	0.5
mid-block 1st and Stevens	west	U25880	861.8	862.3	-0.5	861.8	862.3	-0.5	0.0	0.0	861.8	862.4	-0.6	0.0	0.1
1st Ave	west	U25890	864.3	864.9	-0.6	864.3	864.9	-0.6	0.0	0.0	864.3	864.9	-0.7	0.0	0.1
Mid-block Nicollet and 1st Ave	west	U25893	864.8	865.6	-0.8	864.8	865.6	-0.8	0.0	0.0	864.8	865.7	-0.9	0.0	0.1
46th conn to mainline lowpoint		*46TH*	*829.2*	*832.0*	*-2.8*	*829.2*	*832.4*	*-3.2*	*0.0*	*0.4*	*829.2*	*832.1*	*-2.9*	*0.0*	*0.0*
Stevens Ave	west	U25262	859.3	854.3	5.0	859.3	854.3	5.0	0.0	0.0	859.3	854.3	5.0	0.0	0.0
mid-block 1st and Stevens	west	U25273	860.8	858.3	2.6	860.8	858.3	2.6	0.0	0.0	860.8	857.7	3.1	0.0	-0.5
1st Ave (east side)	west	U25286	862.3	861.0	1.3	862.3	861.0	1.3	0.0	0.0	862.3	860.1	2.2	0.0	-0.9
1st Ave (west side)	west	U25290	862.3	861.7	0.7	862.3	861.7	0.7	0.0	0.0	862.3	860.7	1.6	0.0	-1.0
Mid-block Nicollet and 1st Ave	west	U25296	864.8	863.9	0.9	864.8	863.9	0.9	0.0	0.0	864.8	862.5	2.3	0.0	-1.4
45th St. conn to 35W trunk		*45TH*	*831.3*	*831.9*	*-0.6*	*831.3*	*832.3*	*-1.0*	*0.0*	*0.4*	*831.3*	*831.9*	*-0.6*	*0.0*	*0.0*
NB Ramp frm 46th to 35W	*west*	*U24771*	*852.4*	*840.1*	*12.3*	*852.4*	*840.3*	*12.1*	*0.0*	*0.2*	*852.4*	*840.0*	*12.4*	*0.0*	*0.0*
Stevens Ave	west	U24845	852.3	841.9	10.4	852.3	842.1	10.3	0.0	0.2	852.3	841.9	10.4	0.0	0.0
mid-block 1st and Stevens	west	U24856	847.3	848.1	-0.8	847.3	848.1	-0.8	0.0	0.0	847.3	848.1	-0.8	0.0	0.0
1st Ave (east side)	west	U24864	848.0	848.1	-0.2	848.0	848.1	-0.2	0.0	0.0	848.0	848.1	-0.2	0.0	0.0
1st Ave (lowpoint)	west	U24793	846.3	848.2	-1.9	846.3	848.2	-1.9	0.0	0.0	846.3	848.2	-1.9	0.0	0.0
44th St. conn to 35W trunk		*44TH*	*831.7*	*830.2*	*1.5*	*831.7*	*830.6*	*1.1*	*0.0*	*0.3*	*831.7*	*830.5*	*1.2*	*0.0*	*0.3*
NB Ramp frm 46th to 35W	*west*	*U23888*	*831.7*	*831.8*	*-0.1*	*831.7*	*831.8*	*-0.1*	*0.0*	*0.0*	*831.7*	*831.8*	*-0.1*	*0.0*	*0.0*
Stevens Ave	west	U24127	854.3	846.1	8.2	854.3	846.1	8.2	0.0	0.0	854.3	846.1	8.2	0.0	0.0
mid-block 1st and Stevens	west	U24145	854.6	852.0	2.6	854.6	852.0	2.6	0.0	0.0	854.6	852.0	2.5	0.0	0.0
43rd St. conn to 35W trunk		*43RD*	*829.3*	*828.9*	*0.4*	*829.3*	*829.2*	*0.1*	*0.0*	*0.3*	*829.3*	*829.6*	*-0.3*	*0.0*	*0.7*
35W right of way	*west*	*U23200*	*838.3*	*830.1*	*8.2*	*838.3*	*830.4*	*7.9*	*0.0*	*0.3*	*838.3*	*830.8*	*7.5*	*0.0*	*0.7*
Stevens Ave (east)	west	U23424	840.3	833.3	7.0	840.3	833.3	7.0	0.0	0.0	840.3	833.3	7.0	0.0	0.0
Stevens Ave (west)	west	U23429	840.3	837.7	2.6	840.3	837.7	2.6	0.0	0.0	840.3	837.7	2.6	0.0	0.0
mid-block 1st and Stevens	west	U23436	844.8	843.1	1.7	844.8	843.1	1.7	0.0	0.0	844.8	843.1	1.7	0.0	0.0
42nd St. conn to mainline lowpoint		*42ND*	*822.2*	*828.4*	*-6.2*	*822.2*	*828.7*	*-6.5*	*0.0*	*0.3*	*822.2*	*829.1*	*-6.9*	*0.0*	*0.7*
Stevens Ave (east)	west	U22485	839.1	839.3	-0.3	839.1	839.3	-0.3	0.0	0.0	839.1	839.3	-0.3	0.0	0.0
Stevens Ave (west)	west	U22569	838.8	839.5	-0.8	838.8	839.5	-0.8	0.0	0.0	838.8	839.5	-0.8	0.0	0.0
mid-block 1st and Stevens	west	U22577	839.3	839.7	-0.4	839.3	839.7	-0.4	0.0	0.0	839.3	839.7	-0.4	0.0	0.0
1st Ave (east side)	west	U22587	840.3	840.7	-0.4	840.3	840.7	-0.4	0.0	0.0	840.3	840.7	-0.4	0.0	0.0
40th St. conn to 35W trunk		*40TH*	*832.2*	*833.2*	*-1.0*	*832.2*	*833.2*	*-1.0*	*0.0*	*0.0*	*832.2*	*833.0*	*-0.8*	*0.0*	*-0.1*
Stevens Ave (east)	west	U21092	847.8	835.5	12.3	847.8	835.6	12.2	0.0	0.0	847.8	835.5	12.4	0.0	-0.1
1st Ave (east side)	west	U21136	839.8	840.5	-0.7	839.8	840.5	-0.7	0.0	0.0	839.8	840.6	-0.8	0.0	0.0
Stevens Ave (west)	west	U21145	846.8	836.5	10.3	846.8	836.5	10.3	0.0	0.0	846.8	836.4	10.4	0.0	-0.1
1st Ave (lowpoint)	west	U21149	839.3	840.6	-1.2	839.3	840.6	-1.2	0.0	0.0	839.3	840.6	-1.3	0.0	0.0
39th St. (tunnel drop shaft)		*DS1(39th)*	*837.2*	*838.1*	*-0.9*	*837.2*	*838.1*	*-0.9*	*0.0*	*0.0*	*837.2*	*837.3*	*-0.1*	*0.0*	*-0.7*

35W Flooding Events listed in the RTMC Radiolog System Detail Call Report by location*:

26th Street	28th Street	Diamond Lake Rd.	35th Street
6/11/2002	6/5/2004	6/24/2002	7/24/2002
4/19/2004(NB & SB)		8/2/2002	
10/28/2004		9/6/2002	
9/5/2004		7/11/2003	

Lake Street	46th Street	60th Street	Penn – Ramp
6/25/2002	7/20/2002	6/21/2002	6/4/2002

TH 62 @ Portland
4/16/2003

---

*These events were logged by dispatch under code 110 FLOODING

Appendix D

Correspondence

D1 – Record of Conversation with MWMO regarding the GAP segment treatment requirements

D2 – Record of Conversation with Mike Findorff (MPCA) regarding alternative sequencing to meet the NPDES Permit

D3 – MWMO Email regarding Treatment Standards for Study Area

D4 – Email from Beth Neuendorf MnDOT WRE regarding MnDOT and City storm sewer systems

This Page Left Blank Intentionally

From: Stephanie Johnson
To: Justin Klabo; Neuendorf, Beth (DOT)
Cc: Dan Kalmon; Stephanie Johnson
Subject: RE: Follow-up from Aug 11th meeting
Date: 08/27/2014 12:49 PM

Hi Justin –

Thanks for the call to clarify the agreed-upon timeline for this project. I misunderstood a previous comment. As such, based on our discussion this afternoon, the MWMO will allow MnDOT to continue the I-35W Corridor project under our current Standards assuming that the project moves forward in a timely fashion and that construction is begun in 2017 (not 2015, as previously stated).

Thanks.

Stephanie

From: Stephanie Johnson
Sent: Monday, August 25, 2014 11:31 AM
To: Justin Klabo; Neuendorf, Beth (DOT)
Cc: Stephanie Johnson; Dan Kalmon
Subject: Follow-up from Aug 11th meeting

Good morning, Justin and Beth –

I'm writing to follow-up on a few issues from the August 11th meeting at SEH on the Preliminary Drainage Report for the I-35W Corridor project.

The first issue is related to the MWMO Standards that apply to this project. As you know, the MWMO is currently undergoing an update to our Watershed Management Plan, including an update to our rate control and water quality Standards. Given the stage of design that this project is at, the MWMO will allow MnDOT to continue the I-35W Corridor project under our current Standards assuming that the project moves forward in a timely fashion and construction is begun in 2015.

The second issue is related to my previous error in reviewing and commenting on the May 27, 2014 version of the Preliminary Drainage Report. I have gone back and reviewed the July 18th version of the report. Consistent with the previous version, we concur that you have shown you are meeting the MWMO's rate control and water quality standards, primarily through the use of

two filtration basins and a series of SPCDs.

Finally, as previously noted, I am curious to see more details about the placement and catchment delineations of the proposed SPCDs. I believe that a memo was going to be created. At this point, it seems this is mainly a discussion between the City of Mpls and MnDOT; however, the MWMO would like to be kept in the loop on the topic. We are curious to see how the issue plays itself out.

Thank you. Let me know if you have any questions.

Stephanie

Stephanie L. Johnson, PhD, PE
Programs Principal
Capital Improvements, Planning, Water & Land Conservation

(612) 746-4978 direct
(612) 465-8780 office
(612) 465-8785 fax

Mississippi Watershed Management Organization
2522 Marshall Street NE
Minneapolis, Minnesota 55418-3329

www.mwmo.org

Connect with us!

Building a Better World for All of Us®

RECORD OF CONVERSATION

Conversation With: Mike Findorff

SEH File No.: HENNC 113114

Co/Org: MPCA - Stormwater

SEH File Loc:

Phone No.: 651-757-2357

Owner's File No.: 651-765-2933

Fax No.:

Date/Time: 11/7/2013 3:00 p.m.

Subject: 35W Corridor Study - 2013 MPCA Permit and Permanent Stormwater Management Sequencing

By: Justin Klabo

Conversation Type:

- ☐ In Person
- ☐ At SEH
- ☐ At Site
- Other:
- ☒ Telephone
- ☐ Incoming
- ☐ Outgoing

Items Discussed:

I called Mike to discuss the newly adopted 2013 Construction Stormwater Permit and how the new requirements will be applied to our project. The main question I discussed with him is how is the new volume reduction standard being applied. This includes discussing the sequencing of BMP and how they are selected based on site specific criteria when infiltration may be not feasible for certain projects.

Per the 2013 Permit, the project is required to infiltrate a volume equal to 1" over the net-new impervious surface area.

I explained to Mike the general location of the project (south of Downtown on 35W) and discussed the current process our design team has taken to meet this goal. The 35W Corridor has very limitied space (currently or proposed) to construct an at grade infiltration feature. Mike agreed and noted that there may be opportunities for infiltration in gore, ramp or other small areas along the project. I talked through our approach to meet the infiltration requirement while dealing with limitiations of right-of-way, soil conditions and other factors.

Mike agreed that not all projects are able to meet the infiltration requirement as noted in the Permit. He said ultimately the project will need to meet the goal of the permit either through infiltration or as a water quality requirement. If it is found through onsite reconassiance that infiltration is not feasible, based on criteria outlined within the permit, alternative BMPs can be used to meet the water quality goal. BMPs to meet the water qualtiy goal include but are not limited to; filtration systems, wet ponds, spcd's and etc. He emphasized that as long as we document the investigation work and the sequencing we have undergone during design process that this would allow the project to ultimately meet the water quality goal and not have to provide onsite infiltration.

Mike also brought up that we can meet the permanent stormwater treatment requirements of the project through the City of Minneapolis MS4 permit. This was discussed briefly but the idea is that the City can construct an infiltration or water quality feature to mitigate this project at a different location within the City.

Follow-Up Required:

Mike noted he is available anytime to discuss the project in more detail. He also noted he would be more than happy to do an informal review of the documentation/sequencing if we are unable to meet the infiltration requirement and decide to move towards meeting the Permit through water quality only.

I told Mike once we are further in the process that I would be in touch to discuss additional details.

Please contact the writer if errors are contained in this record, or if relevant information has been omitted.

c: Mark Dierling | SEH
Ron Leaf | SEH
Anne Haws | SEH
Emily Steingweg | SEH

From: Dan Kalmon
To: Justin Klabo
Cc: Stephanie Johnson
Subject: RE: I-35W Corridor Drainage Study - 94 Commons/Transit-Access/Gap
Date: 03/10/2014 12:11 PM

Justin,
Good talking with you Friday. As I mentioned on the phone this will be MWMO's first go around on permitting a MNDOT project. As such, we want to take a bit more time to establish and formalized the process. So, I am handing this off to Stephanie Johnson our Programs Principal Manager and she will follow up with any additional request for materials or information during this preliminary design phase. In terms of the discussions we have had on the phone, I passed along to Stephanie that staff is interpreting the replacement of the existing roadway area per your description and the Typical Section figure.pdf sent as "mill and overlay" but, the new 6 foot shoulders on both sides will need to comply with MWMO's standards. Please follow up with Stephanie for any additional information or formal reply you may be seeking to complete your preliminary design work by the end of April.

Stephanie's Contact information:
Stephanie L. Johnson, PhD, PE
Programs Principal
Capital Improvements, Planning, Water & Land Conservation

(612) 465-8780 ext. 217
(612) 465-8785 fax

Mississippi Watershed Management Organization
2522 Marshall Street NE
Minneapolis, Minnesota 55418-3329

www.mwmo.org

Thanks,

Dan Kalmon, AICP
Principal Planner

(612) 236 - 3089 cell
dkalmon@mwmo.org

Mississippi Watershed Management Organization
2522 Marshall Street NE
Minneapolis, Minnesota 55418-3329

www.mwmo.org

Connect with us!

From: Justin Klabo [mailto:jklabo@sehinc.com]
Sent: Thursday, March 06, 2014 8:45 AM
To: Dan Kalmon

Subject: RE: I-35W Corridor Drainage Study - 94 Commons/Transit-Access/Gap

From: Dan Kalmon <dkalmon@mwmo.org>
To: Justin Klabo <jklabo@sehinc.com>,
Date: 01/17/2014 10:52 AM
Subject: RE: I-35W Corridor Drainage Study - 94 Commons/Transit-Access/Gap

---

ok

Dan Kalmon, AICP
Planner Program Manager

(612) 236 - 3089 cell
dkalmon@mwmo.org

Mississippi Watershed Management Organization
2522 Marshall Street NE
Minneapolis, Minnesota 55418-3329

www.mwmo.org

Connect with us!

From: Justin Klabo [mailto:jklabo@sehinc.com]
Sent: Wednesday, January 08, 2014 7:06 AM
To: Douglas Snyder
Cc: Dan Kalmon
Subject: RE: I-35W Corridor Drainage Study - 94 Commons/Transit-Access/Gap

Hi Doug,

I just wanted to follow up with you on this. We have developed a detail showing the extent of the pavement replacement in the Gap segment. The agencies are currently reviewing it but I wanted to give you a heads up because I am hoping you are available to review it. I anticipate I will be able to send you the detail the end of this week. If possible would you or Dan be able to review the detail and provide clarification on how this would fit within your requirements by Jan 15?

I apologize for the quick turn around time but we have a meeting at the end of that week and I would like to provide them with an update regarding this area.

Thanks for the help and I will be sending the detail in a couple of days.

Justin Klabo, PE | Water Resources Engineer
SEH | 3535 Vadnais Center Drive | St. Paul, MN 55110-5196
651.765.2933 direct | fax 651.490.2150

www.sehinc.com
SEH --- Building a Better World for All of Us™

From: Douglas Snyder <DSnyder@mwmo.org>
To: Justin Klabo <jklabo@sehinc.com>,
Cc: Dan Kalmon <dkalmon@mwmo.org>
Date: 11/12/2013 02:31 PM
Subject: RE: I-35W Corridor Drainage Study - 94 Commons/Transit-Access/Gap

---

On the face of it, it looks as though it will fall under our mill and overlay. I have Dan Kalmon here reviewing our definition and we'll get you a formal response tomorrow or Thursday.

Doug

Douglas Snyder
Executive Director

(612) 465-8780 ext. 205
(612) 360-7747 cell
(612) 465-8785 fax

Mississippi Watershed Management Organization
2522 Marshall Street NE
Minneapolis, Minnesota 55418-3329

www.mwmo.org

From: Justin Klabo [mailto:jklabo@sehinc.com]
Sent: Monday, November 11, 2013 11:38 AM
To: Douglas Snyder
Subject: I-35W Corridor Drainage Study - 94 Commons/Transit-Access/Gap

Hi Doug,

I left you a message last week inquiring about the WMO's rules and how they might apply to a segment of the 35W Project Corridor. At the meeting you attended for the 35W project, they should have discussed how the corridor is being split up into three different segments (94 Commons, Transit/Access, and the Gap).

The 94 Commons and Transit/Access segments are reconstruction projects which are straight forward in regards to your requirements. The Gap segment however is where I have the question. After further discussions with our design staff I have found out that we will be doing a Concrete Pavement Overlay project in this area. If your not familiar with this type of process, they propose to mill off the existing bituminous and place a bond-breaker layer over top of the recently milled roadway. Then they will place the 11 inches of concrete pavement. This is all done without replacing the base material. Ultimately there would be no increase to impervious surface area and the curb alignment would stay as is. MnDOT has started to do this type of work more and more throughout the metro. For other projects throughout the metro it has also been considered a mill & overlay project by other WD's and WMO's, which is exempt from the storm water management standards.

So the question I have for you is the following:

1. Does the Gap segment fall under the WMO's Mill & Overlay exemption which only requires the area to meet the erosion and sediment control standards?

If you want to talk through this in detail feel free to give me a call. Thanks for all of the help!

Justin Klabo, PE | Water Resources Engineer
SEH | 3535 Vadnais Center Drive | St. Paul, MN 55110-5196
651.765.2933 direct | fax 651.490.2150
www.sehinc.com
SEH --- Building a Better World for All of Us™

From: Neuendorf, Beth (DOT)
To: Justin Klabo/seh; Irish, Bruce (DOT); christina.morrison@metrotransit.org; james.grube@co.hennepin.mn.us; james.harwood@metc.state.mn.us; Jenifer.Hager@minneapolismn.gov; Kelly.Moriarity@minneapolismn.gov; Lisa.Cerney@minneapolismn.gov; Mark Dierling/seh; Mike Kotila/seh; Ron Leaf/seh; Rauchle, Ronald (DOT); Carlstrom, Scott (DOT); Pedersen, Scott (DOT); Training Room/St. Paul
Subject: RE: Invitation: I-35W Drainage Meeting (Aug 11 10:00 AM CDT in Training Room/St. Paul@seh)
Date: 08/11/2014 02:04 PM

Justin,

We have decided to not separate out the MnDOT water on this project. This is too long of a stretch and the treatment is mainly on the south end.

Thanks.
Beth

Beth D. Neuendorf, PE
District Water Resources Engineer
MnDOT Waters Edge
1500 W County Road B2
Roseville, MN 55113
(651)234-7520
(651)234-7608 (fax)
beth.neuendorf@state.mn.us

-----Original Appointment-----
From: Justin Klabo/seh [mailto:jklabo@sehinc.com]
Sent: Thursday, July 10, 2014 5:08 PM
To: Justin Klabo/seh; Neuendorf, Beth (DOT); Irish, Bruce (DOT); christina.morrison@metrotransit.org; james.grube@co.hennepin.mn.us; james.harwood@metc.state.mn.us; Jenifer.Hager@minneapolismn.gov; Kelly.Moriarity@minneapolismn.gov; Lisa.Cerney@minneapolismn.gov; Mark Dierling/seh; Mike Kotila/seh; Ron Leaf/seh; Rauchle, Ronald (DOT); Carlstrom, Scott (DOT); Pedersen, Scott (DOT); Training Room/St. Paul
Subject: Invitation: I-35W Drainage Meeting (Aug 11 10:00 AM CDT in Training Room/St. Paul@seh)
When: Monday, August 11, 2014 10:00 AM-11:30 AM Central.
Where: SEH St. Paul Office

This Page Left Blank Intentionally

Appendix E

Stakeholder Meeting Minutes

This Page Left Blank Intentionally

MINUTES

Drainage Kickoff Meeting

Re: I-35W Transit/Access Project
Minneapolis, MN

Date of Meeting: May 3, 2013

Project Manager: Mark Dierling, PE

Time of Meeting: 10:00 a.m. to 12:00 p.m.

SEH No.: HENNC 113114

Location of Meeting: City of Lakes Building
Room 300A

Attendees: See Attached

The following items were discussed at the above referenced meeting:

I. Project Overview
   a. Mark provided a brief overview of the 35W corridor improvements. The Transit Access project is anticipated to go Design-Bid-Build, with an anticipated construction start in the fall of 2017.
   b. Scott discussed the history of flooding along the MnDOT corridor. He provided a handout from FOX 9 news that reported on flooding at 35W and 42nd Street. The flooding took place on June 25, 2010 and is the most recent flooding event within the 35W corridor to date.
      i. Scott also noted that NOAA published Altas 14, which is an update to the rainfall depth frequency estimates. The updated depth for the 100-year rainfall event is 7.4 inches. The existing 100-year rainfall depth is 6.0 inches.
   c. FHWA sent MnDOT a letter during the Crosstown project discussing limited capacity of the downstream tunnel system and the need for upgrades. MnDOT will provide the letter to the group for review.

II. Scope of Work
   a. The original drainage scope of work developed for the project is very brief. There was some question of what work was to be included within the scope of work. Lisa clarified that the scope of work for the transit access project is to develop a design that meets the rate control and treatment requirements and does not cause an increase to the flooding within the downstream tunnel system. The scope of work does not include any improvements to the tunnel itself or the construction of a parallel tunnel as recommended within the St. Mary's Tunnel Study. However, the work shall consider possible future improvements and the project specific drainage system needs are evaluated.

III. Project Design Requirements
   a. Water Quality – The project will need to remove 70% of Total Suspended Solids (City Standard). This standard is applied to the entire project footprint and not just the net new impervious surface area.
   b. Rate Control – The project will need to maintain existing discharge rates from the project. The project will be evaluated on the current rainfall depths (TP 40) and the updated rainfall depths (Atlas 14).

IV. Storm Water Best Management Practices (BMPs)

a. The project proposes to add approximately 6 acres of new impervious surface area. The project will need to meet the most restrictive storm water management requirements through the use of onsite and/or offsite storm water BMPs.
b. There was a brief discussion regarding types of BMPs and potential locations that could be utilized to meet the project goals. A comprehensive list of possible locations and types of BMPs will need to be created. Each potential location will need to be vetted to determine if it's a viable location and the findings documented accordingly.
    i. The City will provide a map detailing future street or utility reconstruction areas along the 35W project corridor for consideration in determining potential offsite treatment locations.
    ii. As BMPs are developed, the long term maintenance and access to the facilities will need to be well thought out. Currently the City has issues accessing and maintaining the drop shafts.
    iii. MnDOT WRE is against the use of underground storage facilities. However the City would like SEH to thoroughly review underground storage because it might end up as the only viable option for storm water treatment.

V. Meeting Follow-Up
a. SEH requested the as-built drawings for the air relief chambers constructed on 35W.
b. SEH and the City will setup a meeting to discuss the most current model and the data available for the project.

SEH believes that this document accurately reflects the business transacted during the meeting. If any attendee believes that there are any inconsistencies, omissions or errors in the minutes, they should notify the writer at once. Unless objections are raised within seven (7) days, we will consider this account accurate and acceptable to all.

If there are errors contained in this document, or if relevant information has been omitted, please contact Justin at 651.765.2933.

c: File

s:\fj\h\hennc\113114\5-dsgn\50-waterresources\projectmanagement\05032013_35wlake_drainagekickoffmtg_minutes.docx

For Meeting Minutes - See Memorandum of Understanding, dated August 5, 2013, in attached Appendix C.

AGENDA

Storm Water Regulations Meeting

Re: I-35W Transit/Access Project
Minneapolis, MN

Date of Meeting: July 22, 2013

Project Manager: Mark Dierling, PE

Time of Meeting: 12:30 p.m. to 2:00 p.m.

SEH No.: HENNC 113114

Location of Meeting: City of Lakes Building
Room 300A

Invitees: Jeni Hager, Lisa Cerney, Kelly Moriarity, Jim Grube, Beth Neuendorf, John Griffith, Bruce Irish, Ron Rauchle, Mark Dierling, Scott Pedersen, Justin Klabo, Ron Leaf, Lindsey McKenzie, Doug Snyder

The following items are to be discussed at the above referenced meeting:

I. Introductions

II. Roadway Improvements
   a. Project Segments
      i. 94 Commons
      ii. Transit/Access
      iii. Gap (South End)
   b. Final Design Schedule
      i. MnDOT Lead Designers – All Segments
   c. Constructing Letting
      i. MnDOT Letting

III. Storm Water Regulations (refer to Memorandum)
   a. Rules
      i. City of Minneapolis
      ii. Mississippi WMO
      iii. MPCA Construction Stormwater Permit (2013 Permit Update)
   b. Project Design Standards
      i. Water Quality
      ii. Rate Control
      iii. Volume Reduction

IV. 35W Flooding
   a. Existing Conditions
      i. Critical Flooding Locations
         1. 46th Street Low Point
         2. 42nd Street Low Point
         3. 39th St. Drop Shaft

ii. Preferred Alternative Identified in the 2006 I-35W & St. Mary's Storm Tunnel Study
1. 19 ft Diameter Tunnel

b. Project Design Requirements

V. Permits and Approval Process
a. City of Minneapolis
b. Mississippi WMO
c. Minnesota Pollution Control Agency
i. Updated NPDES Construction Stormwater Permit

c: File

s:\fj\h\hennc\113114\5-dsgn\50-waterresources\projectmanagement\07222013_35wlake_stormwaterreg_agenda.docx

MINUTES

Drainage Design Meeting #3

Re:	I-35W Transit/Access Project Minneapolis, MN	**Date of Meeting:**	September 27, 2013
Project Manager:	Mark Dierling, PE	**Time of Meeting:**	9:00 a.m. to 10:30 a.m.
SEH No.:	HENNC 113114	**Location of Meeting:**	City of Lakes Building Room 300A

Attendees: Jeni Hager, Lisa Cerney, Kelly Moriarity, Jim Grube, Bruce Irish, Mark Dierling, Scott Pedersen, Justin Klabo, Ron Leaf, Christina Morrison

The following items were discussed at the above referenced meeting:

I. Project Overview – The I-35W Corridor Drainage Study extends from the 94 Commons area to 42nd St. The overall study area is broken down into 3 different segments. As we move through the study phase, results and information will be broken down based on these three segments:
   a. 94 Commons – I-94 and I-35W Interchange
   b. Transit Access – Approx. E. 26th St. to E. 33rd St.
   c. Gap – Approx. E. 33rd St. to E. 42nd St.

II. Existing Conditions Hydraulic Modeling – The process to update the existing conditions XPSWMM analysis is ongoing. SEH has been working with the City to update the existing model and establish the new baseline conditions.
   a. The attached XPSWMM results detail the evolution of the model based on past modeling results and the addition of Atlas 14 rainfall depths. Ultimately, the baseline results or flooding depths will be based on the "2013 SEH Model" which accounts for Atlas 14 rainfall depths.

III. Water Quality Goals – The total project water quality goals were provided in a flow chart. The flow chart detailed the hierarchy to meet the total goal along with quantities for each respective BMP. The quantity for each BMP is an order of magnitude estimate and is not to be taken as the ultimate goal of the project. The information developed will be used to spring board into the BMP design.
   a. The Total Project Water Quality Goal flow chart has been modified to include additional information as discussed during the meeting. Each BMP is mutually exclusive and independent to meet the overall goal. For instance under the NPDES Requirement, the project would only need to construct XX acres of an infiltration basin, not a infiltration basin + wet pond + SPCD to meet the total goal for the NPDES requirement.
   b. To quantify the NPDES Wet Pond goal, the pond size was based on 1800 cf/ac of contributing area over the net new impervious surface area. Ultimately not just the net new impervious surface area will be able to be captured and routed to the pond so a factor of three was applied to the area to determine the permanent pool volume.
   c. The Wet Pond footprint for the WMO goal was calculated based on the Walker Pond Method to size the permanent pool for a typical pond to achieve NURP removal efficiencies.

d. **SEH will verify the current existing and proposed impervious surface area breakdown. This will be provided in the same format that Scott (SEH) has provided in the past.**

IV. Best Management Practices

a. The spreadsheet provided details the four main categories of BMPs to utilize on the project:
   i. Infiltration
   ii. Storm Water Pond
   iii. Filtration
   iv. SPCD

b. The spreadsheet handed out at the meeting only includes the first few columns of the overall BMP master list. Additional columns have been added to the spreadsheet for the City, County and MnDOT to add in their current stance on the different types of BMPs listed.

V. MnDOT Updates

a. Bruce noted that MnDOT is in the process of scoping a project to inspect and rate the storm sewer infrastructure located within the 35W Corridor Drainage Study Area.

b. The inspections are anticipated to start in late spring or early summer of 2014.

c. Bruce noted that based on the latest concept of the Gap Segment, their will need to be increased cb's to limit the spread based on the concept of narrowing the inside and outside shoulders.
   i. Bruce noted that their maybe the possibility to install a traffic management system noting that the outside lane is closed when heavy rainfall occurs. This would possibly mitigate the need for increased cb's and storm sewer. This is only possible if the outside curb line can be left as is and does not need to be moved.
   ii. SEH will review the existing storm sewer infrastructure and work with Bruce to determine inspection needs along the corridor. This is anticipated to be completed in the spring of 2014.
   iii. The current scope of work does not include detailed cb design for the Gap Segment, however **SEH will review average spacing for existing catch basins and compare it against the new spread allowance based on the new roadway typical sections and the Atlas 14 data.**

VI. Meeting Follow-Up

a. BMP List – Meeting participants are to review the overall spreadsheet and provide input for each BMP based on their experiences of maintenance, design and construction.

SEH believes that this document accurately reflects the business transacted during the meeting. If any attendee believes that there are any inconsistencies, omissions or errors in the minutes, they should notify the writer at once. Unless objections are raised within seven (7) days, we will consider this account accurate and acceptable to all.

If there are errors contained in this document, or if relevant information has been omitted, please contact Justin at 651.765.2933.

c: File

s:\fj\h\hennc\113114\5-dsgn\50-waterresources\projectmanagement\09272013_35wlake_sw_mtg3_minutes.docx

XPSWMM Results
I-35W Corridor Drainage Study
HENNC 113114
Date Printed: 10.10.13

Flooding Depth (ft)	Color
No Flooding	
0.0 - 0.5	
0.5 - 1.0	
1.0 - 2.0	
> 2.0	

Table 1- Flooding Depths

Location	Critical Node Locations		2006 Tunnel Study						2013 Mpls Model				2013 SEH Model			
			TP 40[1] (Prev XPSWMM Ver)		TP 40[1] (XSPWMM 2012)		Atlas 14 (XPSWMM 2012)		TP 40[1]		Atlas 14[2]		TP 40[1]		Atlas 14[2]	
	Name	Top of Casting[5] (ft)	Peak HWL (ft)	Δ Elevation [3,4]	Peak HWL (ft)	Δ Elevation [3,4]	Peak HWL (ft)	Δ Elevation [3,4]	Peak HWL (ft)	Δ Elevation [3,4]	Peak HWL (ft)	Δ Elevation [3,4]	Peak HWL (ft)	Δ Elevation [3,4]	Peak HWL (ft)	Δ Elevation [3,4]
I94/35W @ Portland Ave	DS16	812.9	814.6	1.7	815.4	2.6	819.9	7.0	817.9	5.1	821.7	8.9	817.8	4.9	820.5	7.7
35th and 35W- Drop Shaft	DS2(35th)	839.6	838.6	-1.0	839.2	-0.4	839.3	-0.3	838.0	-1.6	839.2	-0.4	838.9	-0.7	840.9	1.3
39th and 35W- Drop Shaft	DS1(39th)	837.6	837.8	0.2	838.2	0.6	838.2	0.6	837.8	0.2	838.2	0.6	838.4	0.8	838.6	1.0
42nd St and 35W- Low Point	42nd	821.5	827.3	5.8	827.4	5.9	829.0	7.5	826.0	4.5	826.4	4.9	828.7	7.2	830.2	8.7
46th St and 35W- Low Point	46th/B5565	830.2	831.9	1.7	831.9	1.7	832.6	2.4	828.3	-1.9	828.9	-1.3	829.6	-0.6	831.0	0.8

[1]TP 40 Rainfall SCS Type II, Depth=5.9"
[2] Atlas 14 Rainfall SCS Type II, Depth=7.5"
[3]Positive number represents flooding
[4]Represents elevation difference between node top of casting and peak water elevation
[5]Verified with City of Minneapolis As-Builts

NEW BASELINE CONDITIONS

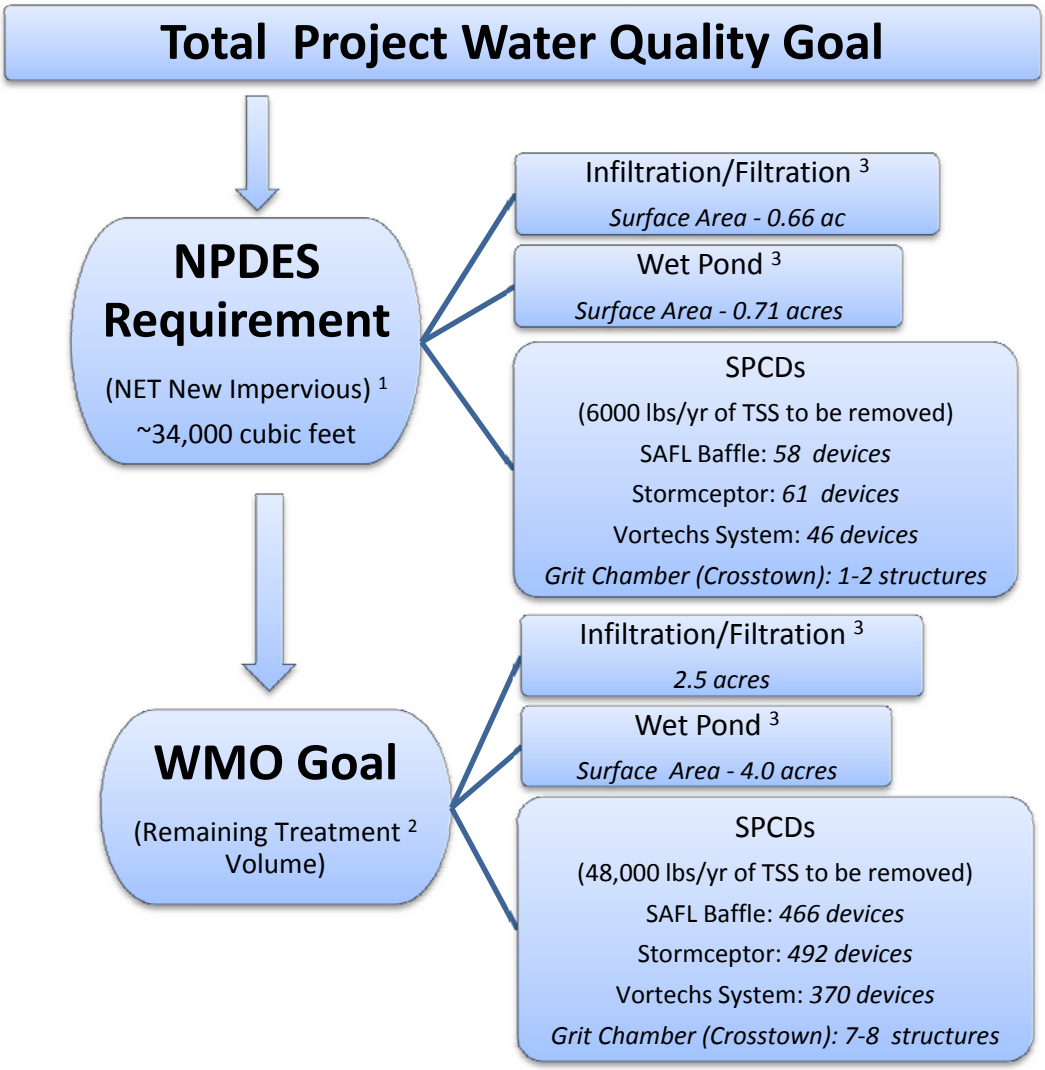
Model Locations:

2006 Mpls Tunnel Study:	Results taken from report
2013 Mpls Model- TP 40	S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\XPSWMM\ExistingConditions\Mpls
2013 Mpls Model- Atlas 14	S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\XPSWMM\ExistingConditions\Mpls Atlas 14
2013 SEH Revised Model-TP 40	S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\XPSWMM\ExistingConditions\SEH_REV\Existing_Mpls_SEHREV_TP40
2013 SEH Revised Model-Atlas 14	S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\XPSWMM\ExistingConditions\SEH_REV\Existing_Mpls_SEHREV_Atlas14

This Page Left Blank Intentionally

I-35W Corridor Drainage Study
Water Quality Treatment Flow Chart
Date: 10.10.13

The table below shows preliminary calculations for pond sizing/number of structures to meet the water quality goal. The values are used to provide an order of magnitude estimate of treatment and compare that against the other forms of BMPs. The values are not intended to be used as a goal, but merely a way to compare the different BMP types at this point in the design.



Notes:

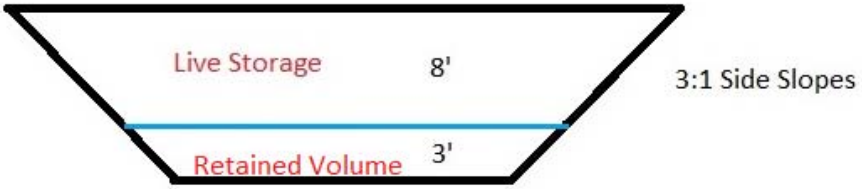
[1] The NPDES is for 1" of rainfall over the change in impervious (net new) which is 9.37 acres. NPDES wet ponds are designed based on a permanent pool volume equal to 1800 cf/ac drained to the pond.

[2] The WMO remaining treatment goal does not include the treatment volume to meet the NPDES goal. The permanent pool volume for wet ponds was determined based on the Walker Pond Method to size ponds based on achieving NURP removal rates.

[3] Areas for basins are based on the surface area at the top of the pond. Wet pond surface area sizes are subject to variability based on the size and imperviousness of the contributing drainage area.

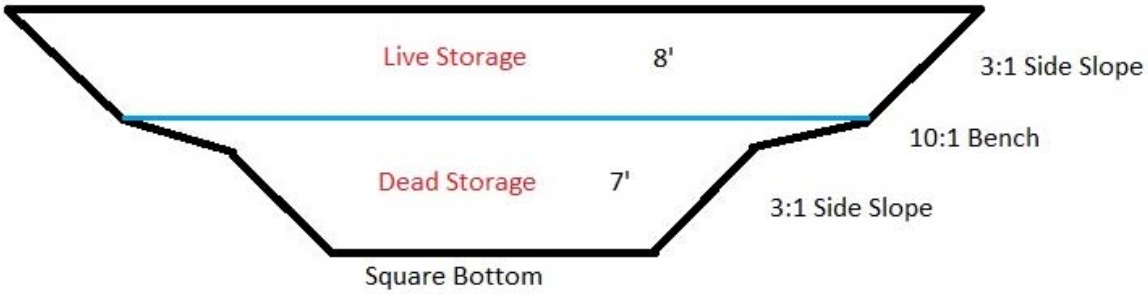
Infiltration Basin

Infiltration basin footprint was based on the detail provided below.



Wet Ponds

Wet Ponds were designed based on the detail provided below.



SPCD's

SPCDs were analyzed based on the following

- 2 acre watershed (100% Imperviousness)
- 6 ft diameter manholes with 3 ft sumps

BMP Location Criteria for Site Selection
I-35W Corridor Drainage Study
HENNC 113114
Updated: 10.10.2013

Task:

Establish criteria to use when determining viable locations for BMPs to meet the treatment goals of the project. This information is used to determine **locations of BMPs for Water Quality only**. The selection criterion for rate control has not been included at this time and will be integrated into the design after the initial phase.

Main Criteria:

1. **Project Limits** – This is defined as future public right-of-way limits of the project (City, County, MnDOT). All areas including green space, roadway, and etc. will be evaluated to construct BMPs.

2. **Green Space areas within the Tunnelshed** – Any open area greater than 0.25 acres will be considered as a potential location.

3. **Identified Flooding Areas within the City** – Based on the 1997 City of Minneapolis Report, all Problem Flood Areas (Located on Figure 8 of the I-35W and St. Mary's Storm Tunnel Study) will be evaluated to determine if they are potential sites for a pond.

4. **Areas outside of the Tunnelshed** – These areas would fall under the alternative sequencing identified by the MWMO and the NPDES Permit.

Sub Criteria:

- **Proximity to Storm Sewer** – All areas that meet the above criteria will be evaluated for storm sewer availability. Any potential pond area that cannot be feasibly routed to a trunk storm sewer line will be eliminated.
- **Contributing Drainage Area to Storm Sewer System** – Sites that meet the previous criteria will be evaluated to determine the amount of area that could be treated by the site. Areas not located near larger storm sewer systems (diameter greater than 24") will be excluded as a regional treatment site.

- **Maintenance Activities** – Sites will be evaluated to determine the safety of accessing and maintaining each feature. For example if traffic control is needed to shut down a lane or close a street temporarily this will be evaluated and rated accordingly.

MINUTES

Drainage Design Meeting #4

Re:	I-35W Transit/Access Project Minneapolis, MN	**Date of Meeting:**	October 21, 2013
Project Manager:	Mark Dierling, PE	**Time of Meeting:**	9:30 a.m. to 11:00 a.m.
SEH No.:	HENNC 113114	**Location of Meeting:**	City of Lakes Building Room 203

Attendees: Jeni Hager, Kelly Moriarity, Jim Grube, Bruce Irish, Mark Dierling, Scott Pedersen, Justin Klabo, Ron Leaf, Christina Morrison, James Harwood, Scott Carlstrom

The following items were discussed at the above referenced meeting:

I. BMP Master List
   a. Jim requested the spreadsheet modified so it is easier to read when printed out. The revised spreadsheet has been attached as a pdf.
   b. Infiltration - MnDOT staff noted that it is MnDOTs policy that no infiltration is allowed underneath the roadway. There is guidance currently being developed by the materials office which explains this policy in more detail. Scott will send a copy of this policy to SEH.
      i. Concerns were brought up in regards to spills on the roadway and how this handled. It was noted in the meeting that we could design pretreatment devices upstream of the infiltration feature to capture a volume of spilled material prior to entering into infiltration feature.
      ii. Bruce noted that Beth might have some additional questions or comments in regards to infiltration within the corridor. Scott was going to follow up with Beth and send any comments or questions that she has.

II. BMP Location Criteria for Site Selection
   a. The site selection process is based on previous discussions with Doug Snyder. Doug noted first meet the NPDES Permit requirements then any meet the remaining WMO requirements offsetting treatment provided to meet the NPDES Permit.
      i. SEH will review NPDES Permit in regards to sequencing and how its applied to this project.
   b. Based on this, our approach to meeting the goal consisted of meeting the NPDES Permit requirements through infiltration as the first step.
      i. Infiltration – The Transit/Access area is the only segment that proposes to create more than 1 acre of new impervious therefore this is the only area that will need to provide infiltration. Based on a review of the soil borings, an area from approximate Station 694+00 to 705+00 has potential for infiltration. The area has a layer of confining or unsuitable material for infiltration which would need to be removed. However, the soils below this layer consist primarily of sand which has potential for infiltration. The ground

water level observed based on the soil borings is approximately 40 feet below the proposed roadway profile therefore this does not limit the potential or infiltration.

1. It was brought up whether the project was located within a DWSMA. SEH will review the boundaries and provide an answer at the next meeting.

ii. SPCD's – The remaining treatment to meet the WMO goal for the segments is proposed to be met with SPCD's. SPCD's will be located along trunk storm sewer lines capturing stormwater and TSS from the system.

c. Storm Water Routing

i. MnDOT noted for storm water routing and treatment purposes that if we can separate the water from City, MnDOT and County areas into individual systems/treatment that this is ideal. SEH will review storm water routing as concepts are developed to attain this goal.

III. Meeting Follow-Up

a. BMP List – Meeting participants are to review the overall spreadsheet and provide input for each BMP based on their experiences of maintenance, design and construction.

b. MnDOT will send over comments in regards to infiltration or filtration features within the 35W Corridor.

SEH believes that this document accurately reflects the business transacted during the meeting. If any attendee believes that there are any inconsistencies, omissions or errors in the minutes, they should notify the writer at once. Unless objections are raised within seven (7) days, we will consider this account accurate and acceptable to all.

If there are errors contained in this document, or if relevant information has been omitted, please contact Justin at 651.765.2933.

c: File
Lisa Cerney | City of Minneapolis

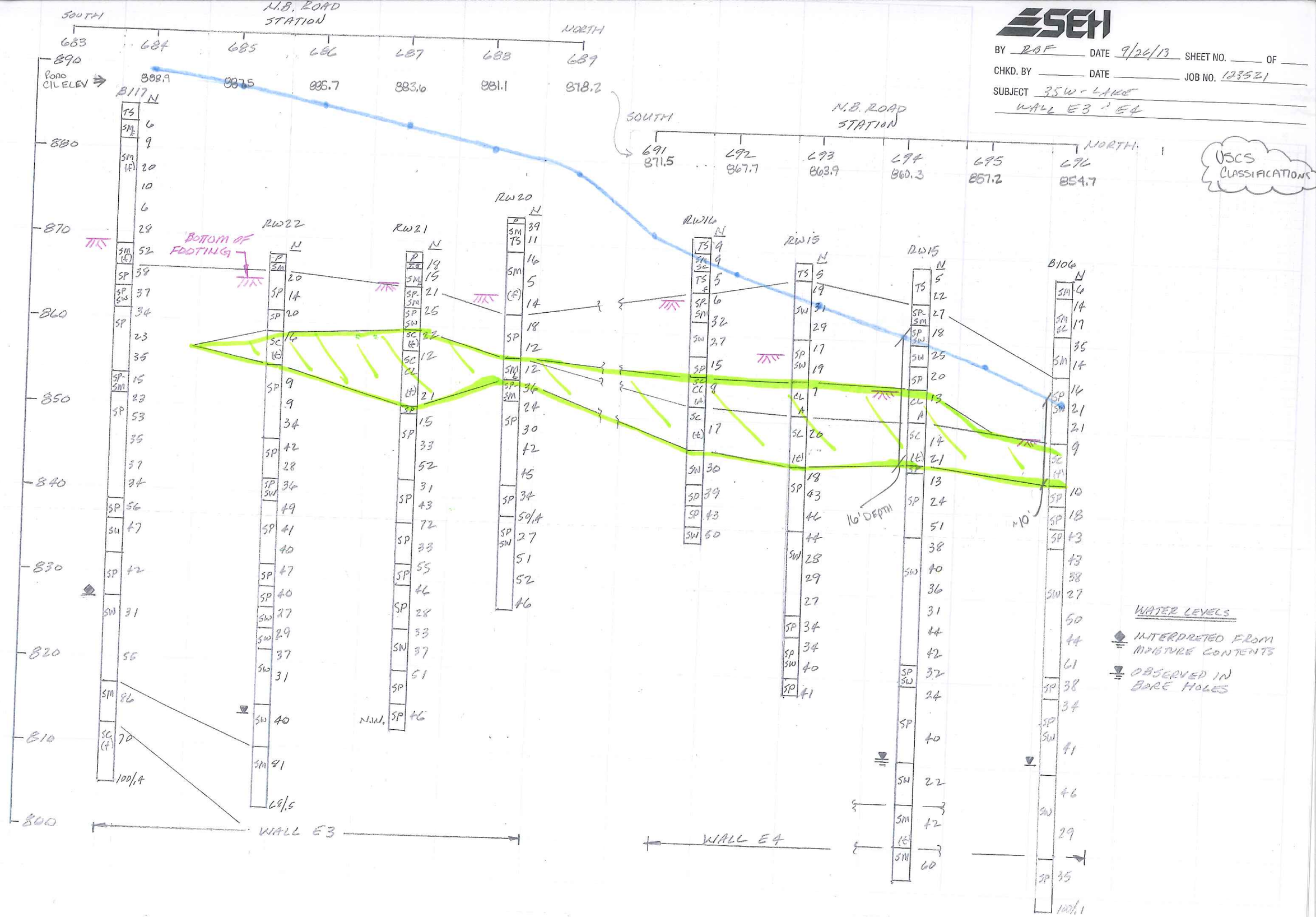
s:\fj\h\hennc\113114\5-dsgn\50-waterresources\projectmanagement\meeting4_info\10212013_35wlake_sw_mtg4_minutes.docx

SEH

BY RAF DATE 9/26/13 SHEET NO. ____ OF ____

CHKD. BY ____ DATE ____ JOB NO. 123521

SUBJECT 35W - LAKE WALL E3 & E4



This Page Left Blank Intentionally

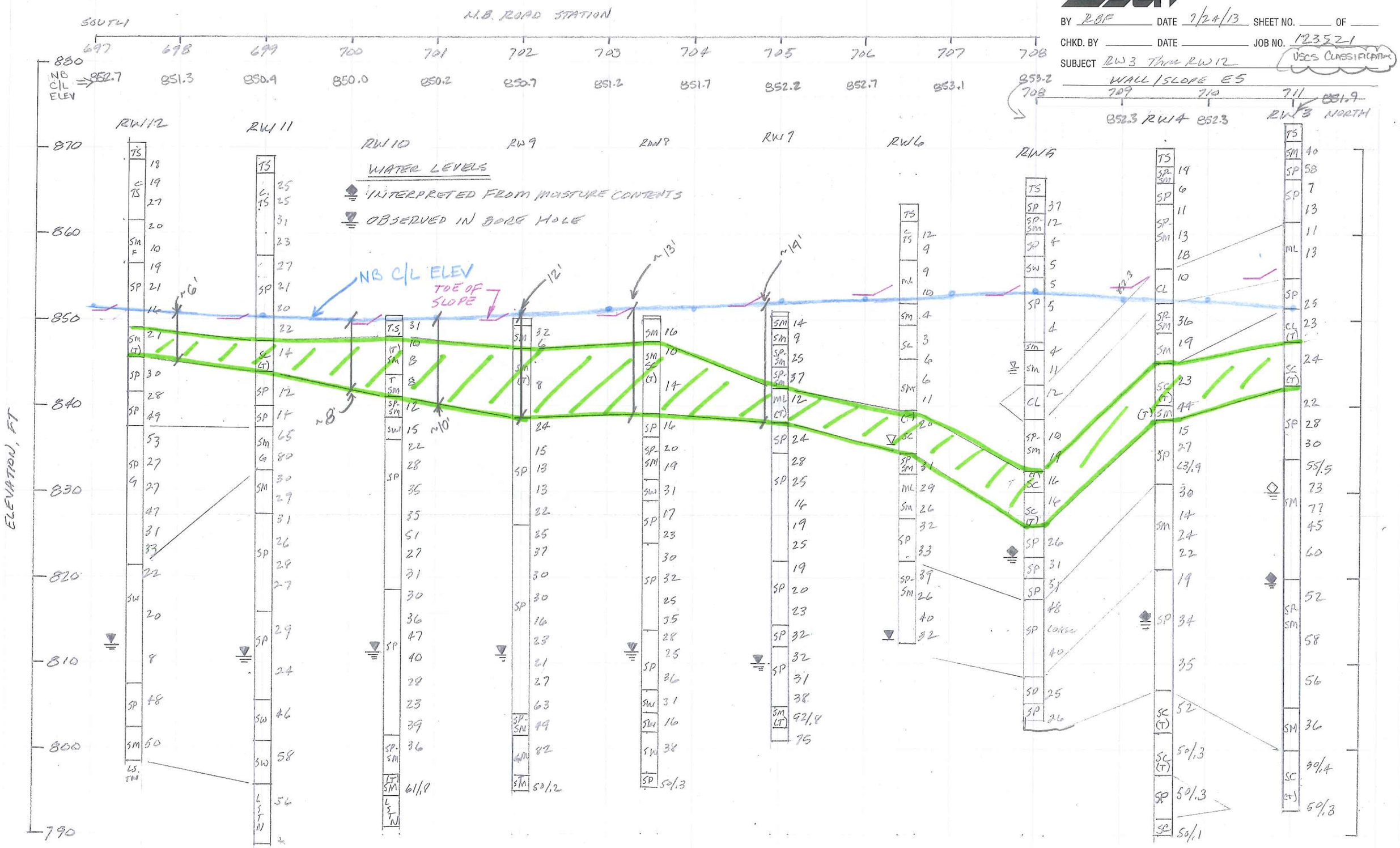
SEH

BY RBP DATE 7/24/13 SHEET NO. ____ OF ____

CHKD. BY ____ DATE ____ JOB NO. 123521

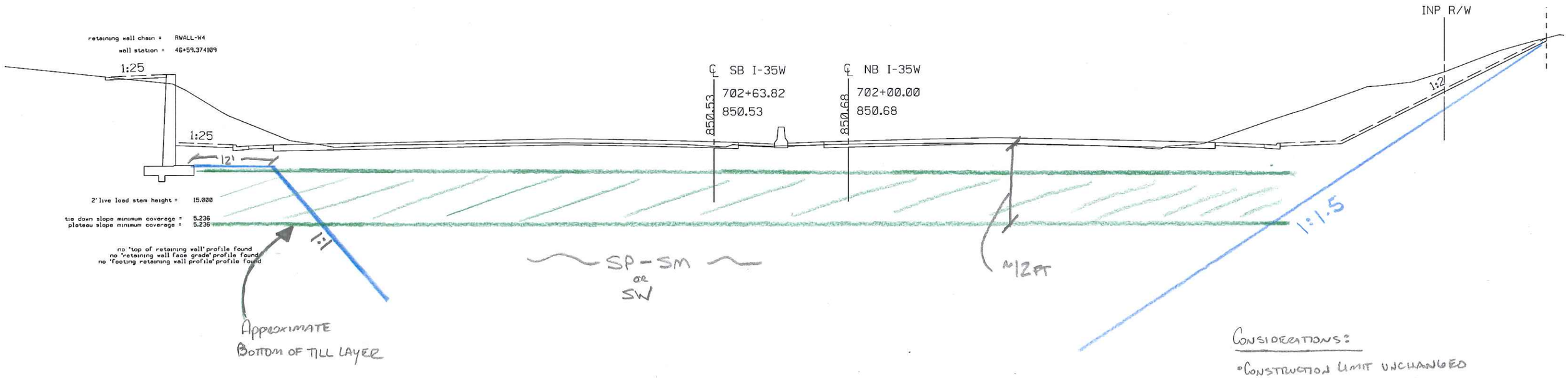
SUBJECT RW3 THRU RW12 USCS CLASSIFICATION

WALL/SLOPE ES



This Page Left Blank Intentionally

I-35W Corridor Study
Sta 702+00 (NB)
10.18.13



Construct Underground Infiltration Feature

- Pipe Gallery
- Arch System
- Concrete Structure w/ Open Bottom

Considerations:

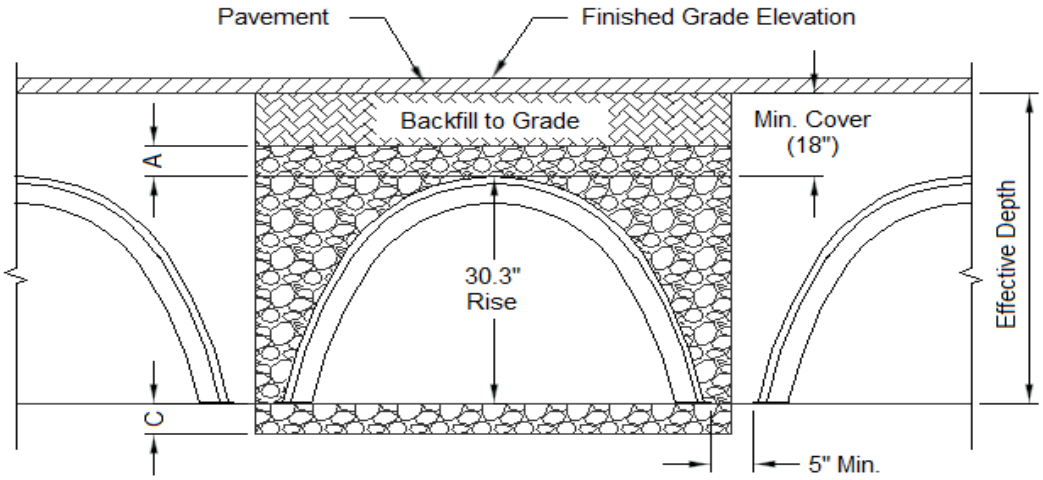
- Construction Limit Unchanged
- Temporary Shoring potentially needed

1"=15' Horz/Vert

This Page Left Blank Intentionally

SPCD Underground Infiltration Option
I-35W Corridor Drainage Study
HENNC 113114
Date: 10.18.13
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\StormwaterBMPs

ChamberMaxx

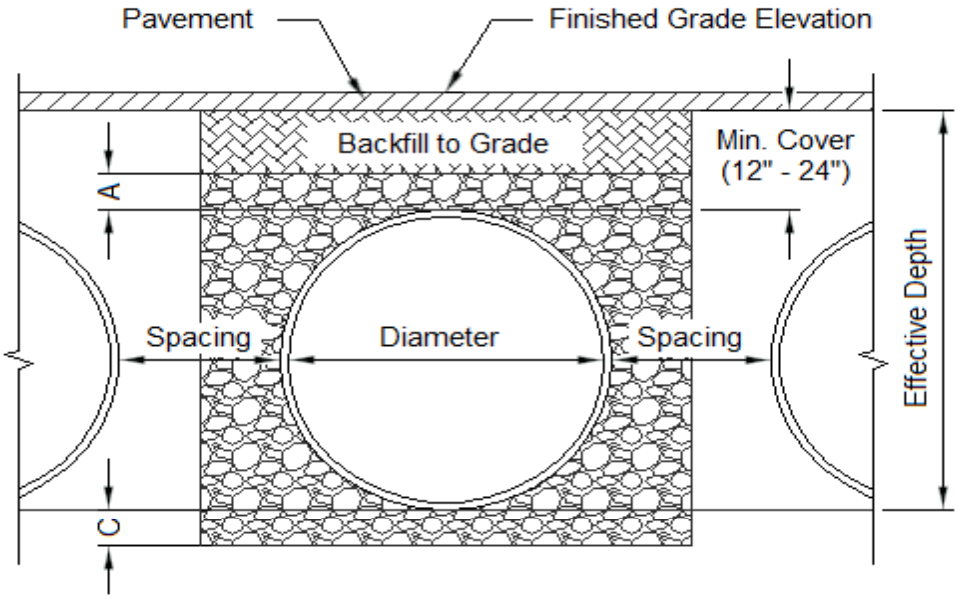


Treatment Volume 35000 cf

Option	No. of Rows	No. of Chambers	Width of Chamber (in)	Rise (in)	No. of Headers	Header Diameter (in)	Porous Stone Above Chamber (in)	Footprint Width (ft)	Footprint Height (ft)	Length (ft)
1	4	545	51.4	30.3	1	24	6	20.5	36	981
2	6	553	51.4	30.3	1	24	6	30	36	668
3	9	559	51.4	30.3	1	24	6	44	36	455

SPCD Underground Infiltration Option
I-35W Corridor Drainage Study
HENNC 113114
Date: 10.18.13
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\StormwaterBMPs

CMP Pipe Gallery

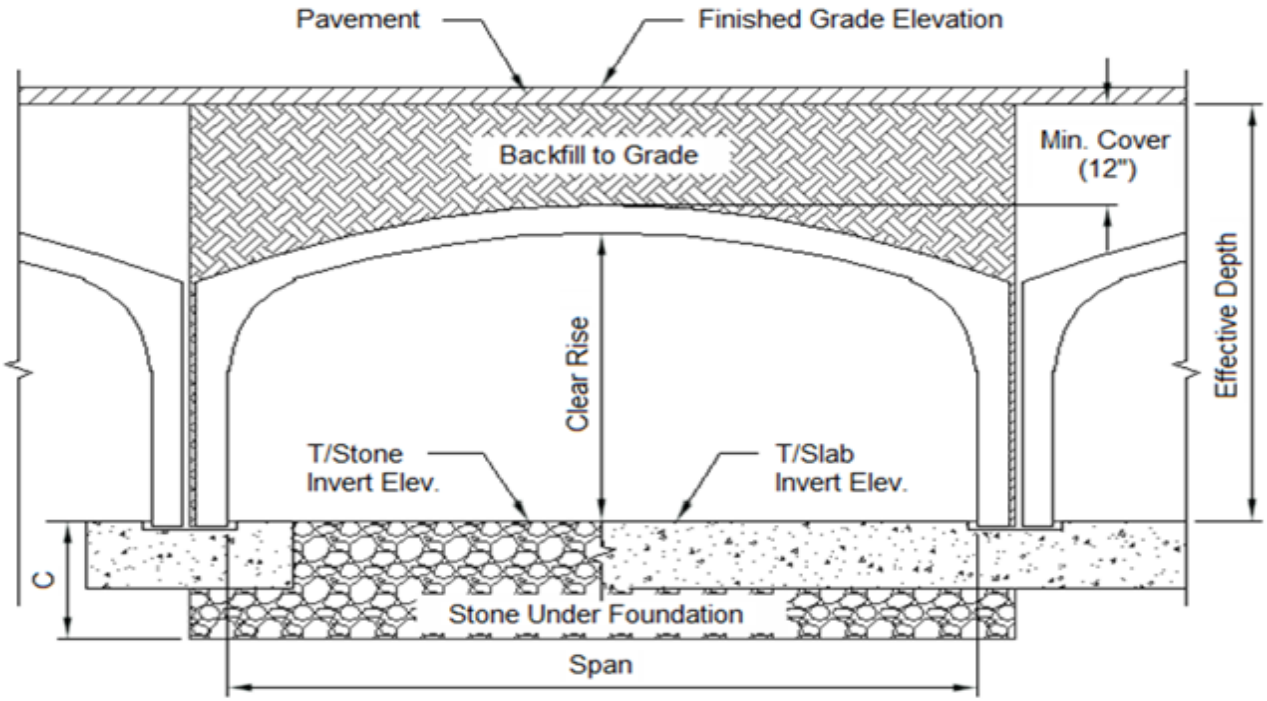


Treatment Volume 35000 cf

Option	No. of Barrels	Diameter of Barrel (in)	No. of Headers	Space Between Barrels (in)	Porous Stone Above Chamber (in)	Footprint Width (ft)	Footprint Height (ft)	Length (ft)
1	3	36	1	27	6	14	3.5	997
2	2	54	1	27	6	14	5	730
3	3	54	1	27	6	20	5	476
4	6	54	1	27	6	41	5	241

SPCD Underground Infiltration Option
I-35W Corridor Drainage Study
HENNC 113114
Date: 10.18.13
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\StormwaterBMPs

ConSpan



Treatment Volume 35000 cf

Option	No. of Cells	Span (ft)	Clear Rise (ft)	Allowable Infiltration Depth (ft)	Porous Stone Below Chamber (in)	Footprint Width (ft)	Footprint Height (ft)	Length (ft)
1	1	20	10	6	6	25	10	292
2	1	20	8	6	6	25	8	292
3	1	24	8	6	6	30	8	245

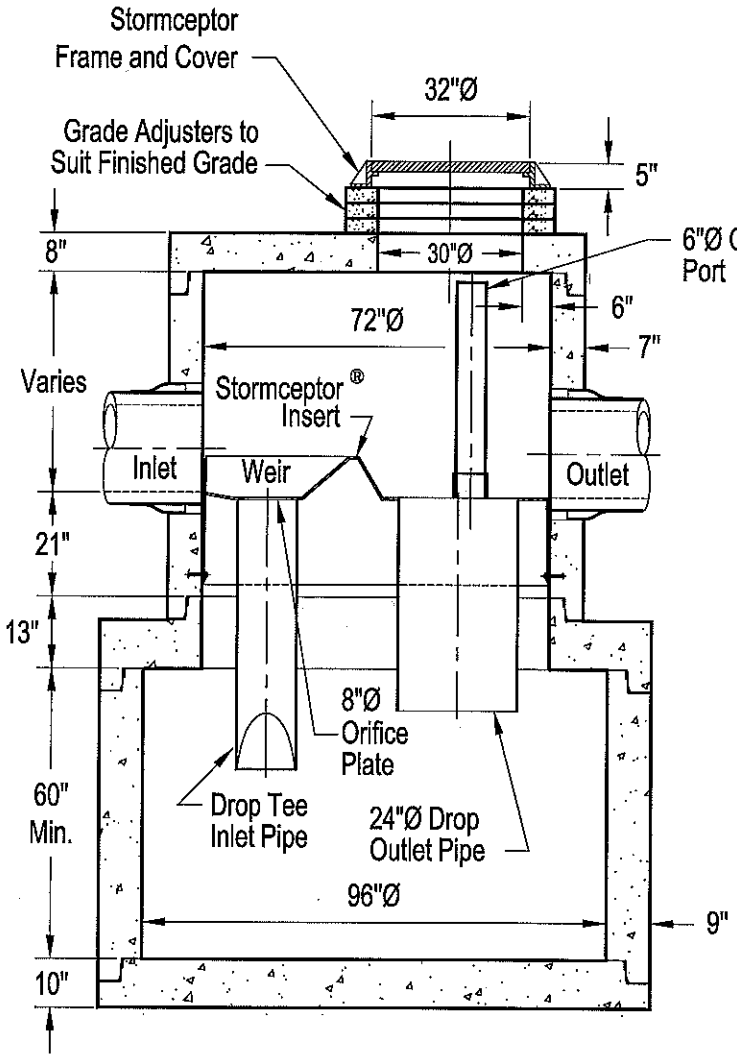
*Span can range from 12 to 36 feet

Photo taken from www.stormceptor.com

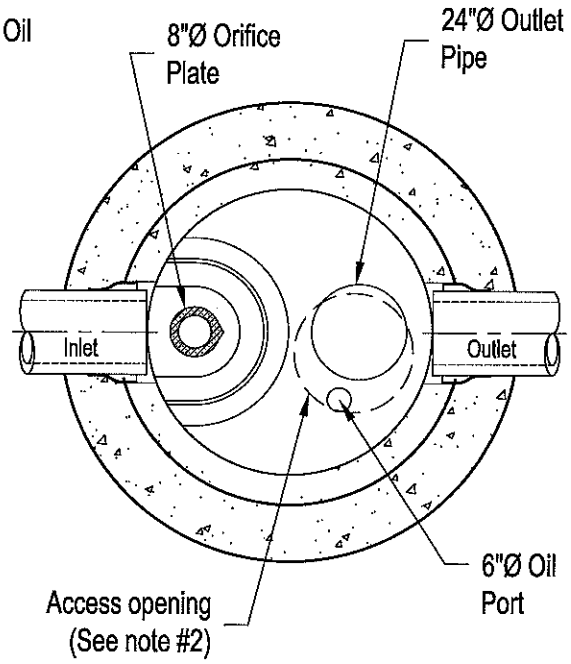
Rinker MATERIALS™

Concrete Pipe Division

STC 2400 Precast Concrete Stormceptor®
(2400 U.S. Gallon Capacity)



Section Thru Chamber



Plan View

Notes:

1. The Use Of Flexible Connection is Recommended at The Inlet and Outlet Where Applicable.
2. The Cover Should be Positioned Over The Outlet Drop Pipe and The Oil Port.
3. The Stormceptor System is protected by one or more of the following U.S. Patents: #4985148, #5498331, #5725760, #5753115, #5849181, #6068765, #6371690.
4. Contact a Concrete Pipe Division representative for further details not listed on this drawing.

SPCD Manhole BMP Comparison
I-35W Corridor Drainage Study
HENNC 113114
Date: 10.18.13
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\StormwaterBMPs

Table 1. I-35W SPCD Design Summary

Location	DrainageArea (ac)	Impervious %	SHSAM Total Load Removed[1] (lbs)	SHSAM Total Load[1] (lbs)	SHSAM % TSS Removal Efficiency	Load Removed per Year (lb)	SPCD Device	Model Diameter (ft)
94 Commons	5.12	90	39939	58748	68	3328	Stormceptor	8
Transit Access	6.97	90	51184	79977	64	4265	Stormceptor	8
South Gap	6.92	90	50899	79407	64.1	4242	Stormceptor	8
Total						**11835**		

[1]Over a 12 year period

For all modeling, the following assumptions were used:
1. Hydraulic Length = 1000 feet
2. Average slope = 1%
3. Pervious Curve Number = 61
4. Sump cleaned out once per year for SPCDs
5. No washout was incorporated in the modeling

Table 2. I-35W Treatment Goal using SPCD's

TSS Removal Goal (lb/yr) - WMO Goal	54000
Number of SPCD Devices	13.7
Avg. Load Removed per Year	3945

This Page Left Blank Intentionally

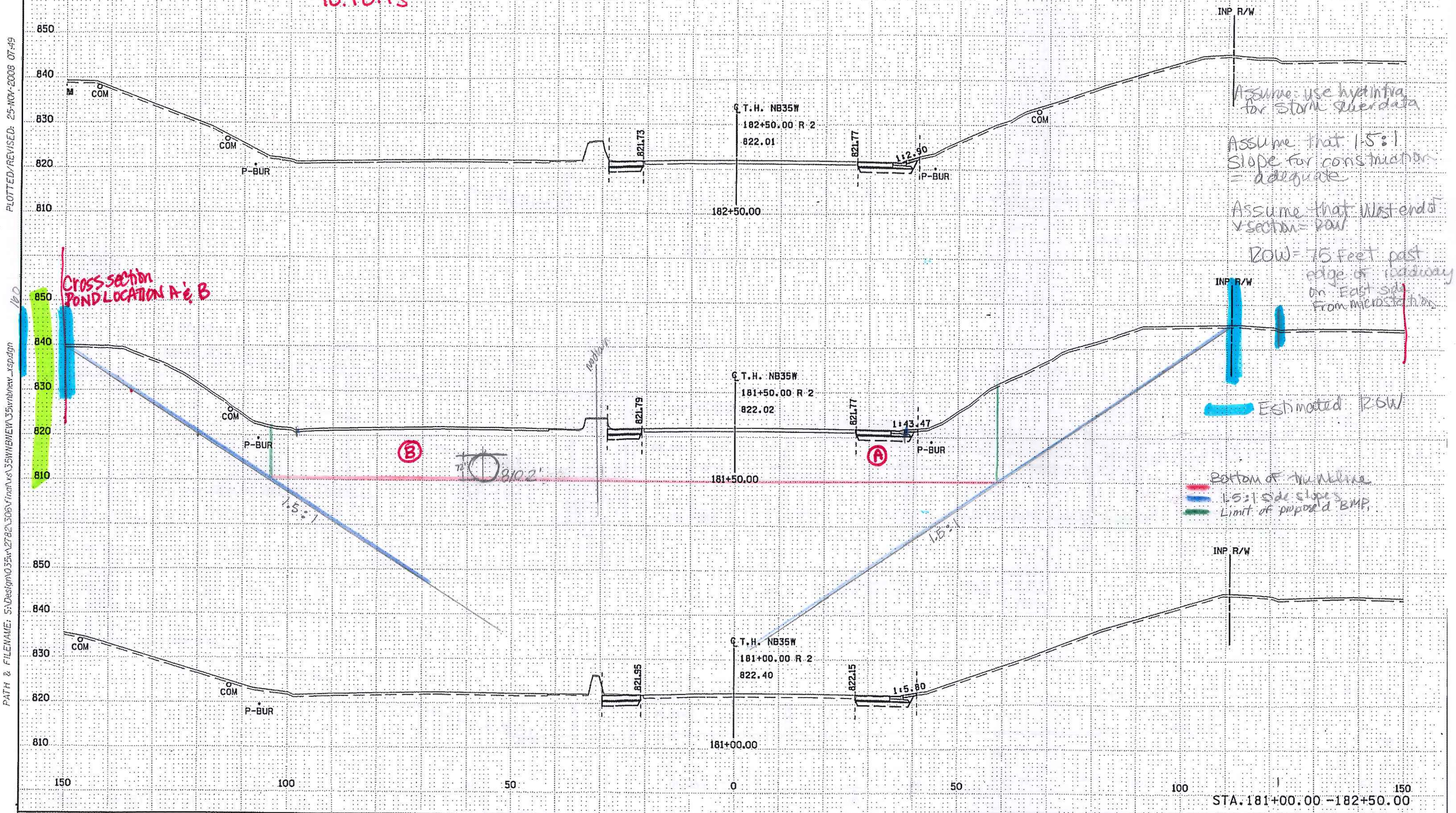
20 scale

Proposed Alignment Stationing: 604+00

I-35W Corridor Drainage Study

10.18.13

EXCAVATION CU.YD.	EMBANKMENT CU.YD.



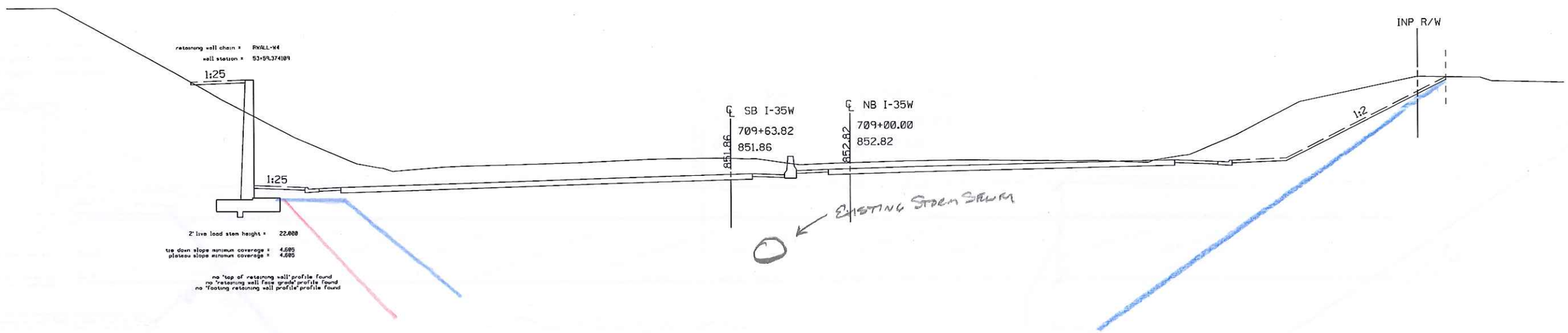
DISTRICT * : METRO
IPLOT NAME: 35wnbnew_xsp02
PATH & FILENAME: S:\Design\035w\2782\306\Hydrlxs\35WNBNEW\35wnbnew_xsp02.dgn

PLOTTED/REVISED: 25-NOV-2008 07:49

STATE PROJ. NO. 2782-306 (TH 35W) SHEET NO. 254 OF 323 SHEETS

This Page Left Blank Intentionally

I-35W Corridor Study
Sta 709+00 (NB)
10.18.13



This Page Left Blank Intentionally

MINUTES

Drainage Design Meeting #5

Re: I-35W Transit/Access Project
Minneapolis, MN

Date of Meeting: November 18, 2013

Project Manager: Mark Dierling, PE

Time of Meeting: 9:30 a.m. to 11:00 a.m.

SEH No.: HENNC 113114

Location of Meeting: City of Lakes Building
Room 203

Attendees: Jeni Hager, Kelly Moriarity, Jim Grube, Bruce Irish, Mark Dierling, Scott Pedersen, Justin Klabo, Ron Leaf, James Harwood, Ron Rauchle, Beth Neuendorf

The following items were discussed at the above referenced meeting:

I. Treatment Goals – Sequencing

a. They proposed construction methods for the Gap segment were discussed. SEH noted that it appears that the Gap segment would fall into the "mill and overlay" category for the Mississippi WMO (MWMO) and would not require treatment. SEH will create a typical section for MnDOT to review and ultimately have SEH pass along to the MWMO for clarification on their rules.

b. SEH contacted Mike Findorff (MPCA) to discuss the recently adopted 2013 NPDES Permit and how the permanent storm water management sequencing is applied to our project. SEH provided the Record of Conversation with Mike as an attachment to the agenda. In summary, Mike noted that if the project is unable to feasibly integrate infiltration onsite then the project can move to meet the water quality goal through other methods such as wet ponds, filtration basins and SPCD's.

   i. It is anticipated that in late December or early January we will send Mike a sequencing memorandum to outline the steps the project has taken to meet the NPDES Permit requirements. Dan Sullivan is the MnDOT liaison to the MPCA so we will work with Dan on any future correspondence with the MPCA.

c. New Impervious Calculations

   i. The group discussed the 3 project segments and the total impervious surface changes. A question was brought up regarding the impervious surface area table and how the breakdown related to the various segments. At this time there isn't a figure detailing the breakdown of which segment includes which impervious surface area therefore SEH will develop this figure and provide it at the next Drainage Meeting in December along with the corresponding table.

   ii. In regards to the NPDES Permit, the Transit/Access and 94 Commons project will be considered 1 combined project requiring treatment for all new impervious surface areas.

II. Potential for Infiltration or Filtration within the Project Area

a. SEH provided a DRAFT memorandum addressing comments and questions regarding the feasibility of integrating infiltration or filtration within the project corridor as an underground feature.

b. After much discussion on the topic it was determined that the project will pursue other forms of treatment because of the issues revolving around maintenance, constructability and overall long-term functionality of the feature. In accordance with the NPDES Permit, the sequencing of BMPs will be documented within the memorandum. SEH will gather comments from everyone and integrate them into the Draft Memorandum. In addition, MnDOT will contact the Materials and Foundations group to set up a meeting discussing the issues that they have in regards to underground treatment structures. SEH will provide a typical section detailing the type of material the feature would be made up of and the location within the roadway section. This will be presented to the Materials and Foundations groups prior to the meeting.
c. SEH will investigate areas along the corridor where above ground infiltration or filtration basins can be constructed as narrow features along the roadway.

III. XPSWMM Analysis
a. SEH provided an update for the modeling and results to date. Based on the current impervious surface area totals, the new impervious surface area creates an additional 4.8 ac-ft of runoff during the 100-year event. SEH is currently reviewing the data to determine what changes there are to the HWL's and existing rates. The City noted to verify HWL's outside of the project boundary are unchanged pre/post project.
b. Jim noted that there were baffles installed on the system along Lake Street as part of the reconstruction project. He was going to send the plans so we can integrate the information into the model accordingly.
c. MnDOT noted that they would like to pursue a variance to the rate control rule of the MWMO for any impacts as part of this project and pursue the impacts as part of a future project. SEH will discuss this with the MWMO to determine if this is possible.

IV. Schedule
a. Next Drainage Meeting – December 16, 9:30-11:00 a.m. – City of Lakes Building

SEH believes that this document accurately reflects the business transacted during the meeting. If any attendee believes that there are any inconsistencies, omissions or errors in the minutes, they should notify the writer at once. Unless objections are raised within seven (7) days, we will consider this account accurate and acceptable to all.

If there are errors contained in this document, or if relevant information has been omitted, please contact Justin at 651.765.2933.

c: File
Lisa Cerney | City of Minneapolis
Christina Morrison | MetroTransit
Scott Carlstrom | MnDOT

MINUTES

Drainage Design Meeting #6

Re:	I-35W Transit/Access Project Minneapolis, MN	**Date of Meeting:**	December 16, 2013
Project Manager:	Mark Dierling, PE	**Time of Meeting:**	9:30 a.m. to 11:00 a.m.
SEH No.:	HENNC 113114	**Location of Meeting:**	City of Lakes Building Room 203

Attendees: Jeni Hager, Kelly Moriarity, Bruce Irish, Mark Dierling, Justin Klabo, Ron Leaf, Ron Rauchle, Beth Neuendorf, Mike Kotila, Christine Morrison

The following items were discussed at the above referenced meeting:

I. Infiltration/Filtration Memorandum
   a. SEH will develop a project specific memorandum outlining the groups concerns regarding infiltration/filtration within the corridor. The SEH memo will include the MnDOT memorandum developed by the Materials group as an attachment. This combined document will be used to as a reference to meet the NPDES sequencing for the project if it is found that infiltration or filtration is not able to be provided along the corridor.

II. Narrow Infiltration/Filtration Areas along the Corridor
   a. SEH provided a sketch detailing the concept of a filtration basin along the corridor. MnDOT noted that we could construct a retaining wall on the backslope of the roadway to increase the volume if necessary.
   b. MnDOT noted that an acceptable infiltration rate for engineered soil would be on the order of 0.8 in/hr allowing up to approximately 32 inches of ponding depth during rainfall events.
      i. Each filtration basin will need to be reviewed to determine if a liner is required based on the proximity to the roadway base and maintaining the integrity of the roadway pavement.
   c. The details will be updated based on discussions with the SEH geotechnical group.
   d. SEH will also develop plan view concepts to go along with the updated section views for the next meeting.
   e. Freeboard for the basins (100-yr) is 1 foot min and 2 feet is desired.
   f. Pretreatment will need to be provided prior to the filtration basins. This is anticipated to be accomplished using SPCD's.
   g. The roadway along the south filtration location is currently being reviewed with the possibility that it will be shifted. The filtration basin along this area will be modified accordingly based on roadway changes.
   h. 33rd & Stevens – MnDOT is working with CNA & SRF to construct a new tunnel access shaft along 35W. SEH will coordinate with them based on the proposed filtration basin design.
      i. The shaft is 12 feet in diameter
      ii. Anticipated to be drilled this fall (2014)

iii. Drift tunnel construction will be in winter of 2014-2015

i. SEH will send MnDOT filtration basins concepts after further refinement

III. XPSWMM Analysis

a. SEH provided an update for the overall hydraulic analysis and the results for rate control and high water levels.

b. SEH went over the results, noting increases in the rate at each tunnel drop shaft location. MnDOT noted that instead of looking at the rate at each drop shaft and mitigating any increase for each, the inflow for all of the drop shafts within the project area should be looked at as a cumulative increase for all and not individually. **SEH will revise the table and look at cumulative inflow rate for all drop shafts and not each individually.** This will allow the reduction in rate control features throughout the corridor.

c. SEH provided a sample detail from cretex with the type of rate control structure used in the modeling scenarios.

i. MnDOT would like to eliminate the use of underground box structures to the extent practical. At a minimum the number of structures proposed needs to be reduced.

ii. SEH will incorporate the storage volume from the proposed filtrations basins. Ideally this would mitigate any rate/HWL change and box structures would not be necessary.

d. HWL Design Standard

i. MnDOT noted that we can adjust the design criteria for the storm sewer system to the following:

1. 0.5 feet of freeboard during the 50yr
2. No change in the HWL's for the major low points on 35W.
3. No increase in the duration of flooding for the 100yr

IV. Water Quality Treatment

a. SEH will provide an update at the next meeting detailing the benefit of the proposed filtration features. SEH will include all the potential SPCD locations in the Report. That way it allows flexibility during final design to pick and choose which locations are preferred.

V. Roadway Design Standards

a. Spread requirements – the current design standard for interstates will be enforced for the roadway. The spread must be confined to the roadway shoulder.

VI. Schedule

a. Next Drainage Meeting – January 17, 9:30-11:00 a.m. – City of Lakes Building

SEH believes that this document accurately reflects the business transacted during the meeting. If any attendee believes that there are any inconsistencies, omissions or errors in the minutes, they should notify the writer at once. Unless objections are raised within seven (7) days, we will consider this account accurate and acceptable to all.

If there are errors contained in this document, or if relevant information has been omitted, please contact Justin at 651.765.2933.

c: File
Lisa Cerney | City of Minneapolis
James Harwood | MetroTransit
Scott Carlstrom | MnDOT
Jim Grube | Hennepin County
Scott Pedersen | MnDOT

MINUTES

Drainage Design Meeting #7

Re:	I-35W Transit/Access Project Minneapolis, MN	**Date of Meeting:**	February 24, 2014
Project Manager:	Mark Dierling, PE	**Time of Meeting:**	9:30 a.m. to 11:00 a.m.
SEH No.:	HENNC 113114	**Location of Meeting:**	City of Lakes Building Room 203

Attendees: Bruce Irish, Justin Klabo, Ron Leaf, Beth Neuendorf, Mike Kotila, Jim Grube, Scott Pedersen, Lisa Cerney

The following items were discussed at the above referenced meeting:

I. Roadway Improvement Status
   a. Gap Segment – SEH is developing two options for MnDOT/FHWA review. The option to not widen or create more impervious surface area is not an option at this time. One of the options provided below will be selected, which will result in increased impervious surface area and ultimately require treatment for the Gap segment
      i. Option A – leave the roadway width as is to accommodate the additional lanes (narrow shoulders) and construct pull-offs.
      ii. Option B – Widen the roadway to accommodate 10 foot shoulders wherever possible

II. Narrow Filtration Areas along the Corridor
   a. Refined typical sections and grading plans were provided for each of the two filtration basin locations. Either option will require modification of the existing storm sewer system to discharge stormwater into the basins. For the North Basin, the proposed roadway alignment causes the existing storm sewer to be located under driving lanes. This was pointed out and noted that this trunk storm sewer system would need to be relocated.
   b. The filtration basins will require guard rail along the roadway. Having guard rail in place allows the basin side slopes to be reduced to a 1:2 slope if desired. SEH will keep this in mind as we work to determine the final treatment goals
   c. Access to the filtration basins was discussed. SEH will develop access & maintenance options and provide the information at the next meeting.
   d. SEH will update the North Basin based on the latest option for the pedestrian bridge
   e. South Basin – This basin is split into two cells around the proposed drop shaft location. Access to the drop shaft is planned to occur off of 33rd & Stevens. A sound wall is proposed to wrap around the access pad. SEH will coordinate with CNA/SRF for the latest basin and drop shaft concept.

III. Treatment Summary
   a. A brief update was provided in regards to the treatment summary. Since the Gap segment improvements were still up in the air, no final treatment summary is able to be provided. SEH will contact the WMO to determine how either option will be handled for the Gap segment and proceed with the design based on that conversation.

b. The filtration basins have additional capacity based on the current proposed increase of impervious surface area. This impervious surface number does not include the Gap segment.

IV. XPSWMM Analysis

a. The proposed conditions model was analyzed based on the updated design criteria and it was found that the rate control requirement was being met. In addition, the model showed the HWL requirements were being met.

V. Hennepin County – West Lake Street Improvements

a. Jim noted that as part of the Hennepin County project that reconstructed West Lake Street, restrictor plates were installed to reduce the peak flows within the storm sewer system as a result of the limited capacity in the downstream tunnel system. Jim will send the design information to SEH for review.

VI. Preliminary Drainage Report

a. SEH will provide the group with a draft report prior to the next meeting. Next meeting will be a kickoff to the draft report allowing the group to provide initial feedback on the report. The report is not intended to be a Final Draft because of outstanding questions that have not been determined at this time. Specifically final improvements to the Gap segment and roadway improvements at 33rd St.

VII. Schedule

a. Next Drainage Meeting – March 31, 9:30-11:00 a.m. – SEH St. Paul Office

SEH believes that this document accurately reflects the business transacted during the meeting. If any attendee believes that there are any inconsistencies, omissions or errors in the minutes, they should notify the writer at once. Unless objections are raised within seven (7) days, we will consider this account accurate and acceptable to all.

If there are errors contained in this document, or if relevant information has been omitted, please contact Justin at 651.765.2933.

c: File
Jeni Hager | City of Minneapolis
James Harwood | MetroTransit
Scott Carlstrom | MnDOT
Christina Morrison | MetroTransit
Mark Dierling | SEH
Ron Rauchle | MnDOT
Kelly Moriarity | City of Minneapolis

s:\fj\h\hennc\113114\5-dsgn\50-waterresources\projectmanagement\meeting7_info\minutes\022414_35wlake_sw_mtg7_minutes.docx

MINUTES

Drainage Design Meeting #8

Re:	I-35W Transit/Access Project Minneapolis, MN	**Date of Meeting:**	March 31, 2014
Project Manager:	Mark Dierling, PE	**Time of Meeting:**	9:30 a.m. to 11:00 a.m.
SEH No.:	HENNC 113114	**Location of Meeting:**	SEH St. Paul Office

Attendees: Bruce Irish, Justin Klabo, Ron Leaf, Beth Neuendorf, Mike Kotila, Jim Grube, Scott Pedersen, Mark Dierling, Jeni Hager, Kelly Moriarity

The following items were discussed at the above referenced meeting:

I. Gap Segment
   a. The proposed improvements for the Gap segment were discussed with the MWMO to determine the requirements for these improvements based on the MWMO goals.
      i. Partial depth pavement replacement area – This area is excempt from the MWMO requirements
      ii. Roadway widening – This area would be required to be treated to meet the goals of the MWMO.
   b. It was requested that SEH verify that they have a record of conversation or email documenting the position of the MWMO. After the meeting SEH reviewed the file and we do have an email documenting the position of the MWMO.

II. Treatment Summary
   a. SEH provided an update for the overall project treatment goals.
   b. Filtration basins are designed to treat the NPDES permit requirements plus an additional volume for the MWMO goals. The remaining volume necessary to meet the MWMO goal will be treated using SPCD's
   c. SEH will review the SPCD locations and recommend locations based on meeting the remaining goal of the MWMO. The recommendation will be based on location, maintenance, cost implications and other factors.

III. XPSWMM Analysis
   a. Rate Control – Rate control is being met based on the improvements proposed
   b. HWLs – Through the QA/QC process, SEH identified a few outlining areas where the depth of flooding was increased. This increase was found to be less than 0.2' and the locations are intermittent throughout the system. SEH will review the model to determine the cause of this change and why it is appearing inconsistently throughout different systems.

IV. Draft Preliminary Drainage Report (PDR)
   a. SEH presented the 75% Draft PDR. It was noted that the 75% Draft doesn't include proposed conditions. The intention o f the 75% Draft PDR is for everyone to be able to comment on the

background, methodology and existing conditions of the report. After comments on these three critical sections are provided, SEH can then finalize the proposed conditions based on any comments provided.

V. Additional Discussion topics
   a. Hennepin County orifices – it was noted that these need to be left in place until a solution is constructed for the flooding within the tunnel system.
   b. Tunnel flooding solution – MnDOT is currently evaluating a cavern solution for the tunnel flooding. The group discussed if it is an option to have the cavern constructed in conjunction with roadway improvements proposed on 35W. MnDOT noted that there is concern that the cavern construction would not be a viable standalone project if it wasn't combined with a roadway improvement project. MnDOT is exploring grant opportunities for the cavern work.

VI. Policy Maker Memorandum
   a. SEH will prepare a brief memorandum discussing the process to date and the improvements being proposed to meet the drainage needs throughout the Study area.

VII. Schedule
   a. Next Drainage Meeting – June 9, 9:30-12:00 a.m. – SEH St. Paul Office

SEH believes that this document accurately reflects the business transacted during the meeting. If any attendee believes that there are any inconsistencies, omissions or errors in the minutes, they should notify the writer at once. Unless objections are raised within seven (7) days, we will consider this account accurate and acceptable to all.

If there are errors contained in this document, or if relevant information has been omitted, please contact Justin at 651.765.2933.

c: File
Christina Morrison | MetroTransit
James Harwood | MetroTransit
Ron Rauchle | MnDOT
Scott Carlstrom | MnDOT

s:\fj\h\hennc\113114\5-dsgn\50-waterresources\projectmanagement\meeting8_info\minutes\3.31.14_35wlake_sw_mtg8_minutes.docx

Appendix F

Stakeholder Comments with Responses

This Page Left Blank Intentionally

REVIEW COMMENT FORM

QA/QC Comments

Project Name **I-35W Transit/Access Project**

SEH Project Number **HENNC 113114**

Submittal Type (50%, etc.) **75% Submittal**

Date of Submittal **3/28/14**

Date of Response **6/2/14**

File: Document2

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Revwer
1	B. Neuendorf (MnDOT)	R	Pg. 1	Sec 1.1	Para 1	The first sentence should read "…stormwater treatment and rate control needs directly related to the proposed improvements, analyses performed and key design elements…"	C, Pg 1, Sec 1.1, P 1	amh	Jk
2	K. Moriarity (CityMPLS)	R	Pg. 1	Sec 1.2	All	Include the portion along I-94 from Loring Pond to the River in the description of the tunnelshed.	C, Added paragraph with Tunnel description, Pg 1, Sec 1.2, P 2	amh	Jk
3	B. Neuendorf (MnDOT)	R	Pg. 1	Sec 1.2	Para 1	It states that "the study area encompasses 140 acres of roadway corridor…". What about city residential/commercial?	C, the 140 acres only refers to the Corridor project area.	amh	Jk
4	B. Neuendorf (MnDOT)	R	Pg. 1	Sec 1.2	Para 3	The second sentence should read "Within the last two decades…."	C, Pg1, S 1.2, P3	amh	Jk
5	B. Neuendorf (MnDOT)	R	Pg. 1	Sec 1.2	Para 3	The third sentence should read "…a solution to the flooding problem and tunnel pressurization….."	C, Pg1, S 1.2, P 3	amh	Jk
6	B. Neuendorf (MnDOT)	R	Pg. 2	Sec 1.3	Para 2	The second sentence should read "…is intended to look at the proposed corridor improvements and impacts that they have to the overall system and it does not address the overall flooding and pressurization issues…"	C, Pg 2, Sec 1.3, P2	amh	Jk
7	K. Moriarity (CityMPLS)	R	Pg. 3	Sec 1.4.2	Para 1	The transit access project segment ends at 32nd not 33rd as stated in the first paragraph.	C, Pg 3, S 1.4.2, P1	amh	Jk
8	K. Moriarity (CityMPLS)	R	Pg. 3	Sec 1.4.3	Para 1	The GAP project starts at 32nd not 33rd as stated in the first paragraph.	C, Pg 3, Sec, 1.4.3, P1	amh	Jk

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question

(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

Project Type

Project Name

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken (C = Correction made. Use dwg or para number where correction made. If not corrected, explain)	Response By	QC Revwer
9	B. Neuendorf (MnDOT)	R	Pg. 4	Sec 2.0	Title	Title should read "Standard and Design Approach	C, Pg 4, Sec 2, Title	amh	Jk
10	K. Moriarity (CityMPLS)	R	Pg. 4	Sec 2.1	All	Are these goals from the elected official group? It seems like project goals should also include maintaining or reducing peak high water levels in the tunnelshed at all locations prone to flooding, not just at the sag points along 1-35W, but I am not sure where these came from. It is addressed later in report.	Revised text within the paragraph to clearly state that the goal of the project is to maintain or reduce hwl's in the tunnelshed at all locations prone to flooding during the 100-year event.	amh	Jk
11	B. Neuendorf (MnDOT)	R	Pg. 4	Sec 2.1	Title	Title should read "Design Approach"	Noted	els	Jk
12	B. Neuendorf (MnDOT)	R	Pg. 4	Sec 2.1	Para 1	The first sentence should read "The design approach is directly linked to the proposed roadway improvements within the project area:	Noted	els	Jk
13	B. Neuendorf (MnDOT)	R	Pg. 4	Sec 2.1	BP 2	"Reduce" – Are you doing this and if so, to what degree?	Some areas are experiencing a small reduction in peak flows (<10 cfs)	amh	Jk
14	B. Neuendorf (MnDOT)	R	Pg. 4	Sec 2.1	BP 3	"Reduce" – Are you doing this and if so, to what degree?	Some areas are experiencing a small reduction in HWLs, varies throughout tunnelshed	amh	Jk
15	B. Neuendorf (MnDOT)	R	Pg. 4	Sec 2.1	BP 3	The following should be added to the end of the sentence "within the project area"	C, Pg 5, Sec 2.1, BP3	amh	Jk
16	B. Neuendorf (MnDOT)	R	Pg. 4	Sec 2.2	Para 1	The first sentence should read "All three project segments are under the stormwater regulations of three organizations/agencies."	C [Para 1]	ELS	Jk
17	J. Grube (HennCty)	R	Pg. 4	Sec 2.2	2.a.	The last sentence should read "….greater than 1.0 acre are required to provide permanent storm water management."	C [Para 2.a]	ELS	Jk
18	B. Neuendorf (MnDOT)	R	Pg. 4	Sec 2.2	Para 5	The second sentence should read "This section summarizes the standards of each agency and identified the design approach for the overall study area that will be used to meet project area requirements."	C	ELS	Jk

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

Project Type

Project Name

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken (C = Correction made. Use dwg or para number where correction made. If not corrected, explain)	Response By	QC Revwer
19	B. Neuendorf (MnDOT)	R	Pg. 4	Sec 2.2	Para 6	The first sentence should read "…developed to establish design standards for the project."	C	ELS	Jk
20	B. Neuendorf (MnDOT)	R	Pg. 4	Sec 2.2	Para 6	The second sentence should read "A copy of the correspondence between SEH and the organizations…."	C	ELS	Jk
21	B. Neuendorf (MnDOT)	R	Pg. 5	Sec 2.2.1	Para 1	The first sentence should read "The water quality standards of the three organizations are shown below:"	C	ELS	Jk
22	B. Irish (MnDOT)	R	Pg. 5	Sec 2.2.1.1	Para 1	90% TSS removal for 1.17" event is difficult to achieve, but, perhaps the assumption of water at 68 F decreases water viscosity enough to enhance particle settling rates sufficiently to meet this criterion. Our typical modeling with SHSAM is based upon TSS removal on an annual average basis with water temperature assumed to equal daily mean air temperature.	Modeling was redone with average daily air temp and a synthetic storm, as per the MWMO and City of Minneapolis criteria.	ELS	Jk
23	J. Grube (HennCty)	R	Pg. 5	Sec 2.2.1.2	Para 1	First sentence – questioning the word "quality".	Sentence modified to define 'quality'	ELS	Jk
24	J. Grube (HennCty)	R	Pg. 5	Sec 2.2.1.2	Para 1	Second sentence – questioning the word "quality".	See Item #23 for clarification on the term "quality"	ELS	Jk
25	B. Neuendorf (MnDOT)	R	Pg. 5	Sec 2.2.1.1	Para 1	"….over the entire site area, not just the areas of the site being developed or disturbed…" – Do you meet this?	This standard is correct and is met. See Section 5.3.1 for how this standard is being met by the project.	ELS	Jk
26	B. Neuendorf (MnDOT)	R	Pg. 5	Sec 2.2.2	Para 1	The first sentence should read "The rate control standards of the three organizations are shown below:"	C	ELS	Jk
27	J. Grube (HennCty)	R	Pg. 5	Sec 2.2.2.2	Para 1	First sentence – questioning the words "require" and "requirement"	"Require" changed to "outline" "Requirement" changed to "goal"	ELS	Jk
28	J. Grube (HennCty)	R	Pg. 5	Sec 2.2.2.2	Para 1	Second sentence – the word "outlets" should be "outlet's"	C	ELS	Jk
29	B. Neuendorf (MnDOT)	R	Pg. 6	Sec 2.2.3	Para 1	The first sentence should read "….flooding during 5 and 10 year events."	C	ELS	Jk

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Revwer
30	B. Neuendorf (MnDOT)	R	Pg. 6	Sec 2.2.3	Para 1	Second sentence should read "…temporary ponding condition on the highway or street."	C	ELS	Jk
31	B. Neuendorf (MnDOT)	R	Pg. 6	Sec 2.2.3	Para 2	No. 1 should read "No increase in the existing flooding High water Levels (HWL)…"	C, Pg 6, S 2.2.3, P2	amh	Jk
32	B. Neuendorf (MnDOT)	R	Pg. 6	Sec 2.2.3	Para 2	In No. 2: "0.5 feet of freeboard" – from what? In No. 2: "No flooding during the 100-year design storm. Flooding is defined as a high water level (water ponding) above the top of casting." – Do we meet this? Even at I-35W sag points?	"From the top of casting elevation" added for clarification, Pg 7, Sec 2.2.3, P2 Answer to second question will be explained in proposed conditions	amh	Jk
33	K. Moriarity (CityMPLS)	R	Pg. 6	Sec 2.3	All	The statement that MnDOT's policy is to follow the MWMO standards and MPCA requirements. Is this policy or a practice?	This is a MnDOT policy and this is followed for their projects	amh	Jk
34	J. Grube (HennCty)	R	Pg. 6	Sec 2.3	Para 1	The second sentence should read "….regards to following the goals adopted by the MWMO."	C	ELS	Jk
35	B. Neuendorf (MnDOT)	R	Pg. 6	Sec 2.3	Para 1	BP 2 should read "MnDOT follows the MWMO standards and the MPCA requirements."	C	ELS	Jk
36	B. Neuendorf (MnDOT)	R	Pg. 7	Sec 2.3.1.3	Para 1	The second sentence should read "the Study is not intended to fix the known capacity issues of the Tunnel or the existing highway and local flooding."	C	ELS	Jk
37	B. Neuendorf (MnDOT)	R	Pg. 7	Sec 2.3.1.3	No. 2	Part a: "0.5 feet of freeboard" – from what?	"from the top of casting elevation" added for clarification, P7, S 2.3.1.3, No 2	amh	Jk
38	J. Grube (HennCty)	R	Pg. 8	Sec 3.1.1	Tab 1	Proposed Roadway, USE – the word "Impervious" should read "impervious"	C	ELS	Jk
39	B. Neuendorf (MnDOT)	R	Pg. 10	Sec 3.2.2	BP 5	Are orifices included? Need to mention this here.	"(including pipes, weirs and orifices)" added for clarification, P11, S 3.2.2, BP5	amh	Jk
40	J. Grube (HennCty)	R	Pg. 10	Sec 3.2.2	All BP	Lake Street? Can we extend to 31st?	"Project Area" added to include those streets	amh	Jk

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken (C = Correction made. Use dwg or para number where correction made. If not corrected, explain)	Response By	QC Revwer
41	J. Grube (HennCty)	R	Pg. 11	Sec 3.2.2.1	Para 1	First sentence – the word "project's" should read "Project's"	C	ELS	Jk
42	K. Moriarity (CityMPLS)	R	Pg. 12	Sec 3.2.2.1.2	Para 1	SCS Type II may not be required with Atlas 14, statement that City requires it may need to be changed.	Now statement reads 'The MWMO requires…..'	ELS	Jk
43	J. Grube (HennCty)	R	Pg. 15	Sec 3.3.1.1	No. 2	Should read "….Any open areas greater than 0.25 acre were considered as a potential location."	C	ELS	Jk
44	B. Neuendorf (MnDOT)	R	Pg. 15	Sec 3.3.1.2.2	Para 2	The first sentence should read "MnDOT has a memorandum detailing the locations…."	C	ELS	Jk
45	B. Neuendorf (MnDOT)	R	Pg. 15	Sec 3.3.1.2.2	Para 2	The second sentence should read "…..Pavement Sections" and is located in Appendix C."	C	ELS	Jk
46	J. Grube (HennCty)	R	Pg. 16	Sec 3.4.1.3	Para 1	First sentence should read "Proposed basin volumes…."	C	ELS	Jk
47	B. Neuendorf (MnDOT)	R	Pg. 16	Sec 3.4.1.4	Para 1	We are likely to use SAFL Baffles on this project. What is the effect on the removal rates?	Additional results have been added, see Section 5.4.1	ELS	Jk
48	B. Neuendorf (MnDOT)	R	Pg. 16	Sec 3.4.1.5	Para 1	Run it with SAFL Baffles	Additional results have been added, see Section 5.4.1	ELS	Jk
49	B. Neuendorf (MnDOT)	R	Pg. 16	Sec 3.4.1.5	BP 5	Why 68 degrees? We typically use daily mean air temp.	Modeling was redone with daily main air temp	ELS	Jk
50	B. Irish (MnDOT)	R	Pg. 16	Sec 3.4.1.5	All BP	The discussion of SPCD Design states that a SPCD tributary area slope of 0.5% and a CN of 69 was used for all model runs. Higher values of slope and CN are likely and would tend to increase size of SPCDs or number of SPCDs to meet MWMO goals. The analysis also used the SPCD with the highest TSS removal rates, but since we cannot specify a particular manufacturer, the size and number of required SPCDs may increase from those to be identified for proposed condition.	See Section 3.4.1.5 for updated modeling inputs. Two different SPCDs were modeled and the removal rates are located in Appendix B.	ELS	Jk

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken (C = Correction made. Use dwg or para number where correction made. If not corrected, explain)	Response By	QC Revwer
51	B. Neuendorf (MnDOT)	R	Pg. 18	Sec 4.1	Para 2	The second sentence should read "The intersection is the junction of the 1-35W Tunnel and a section 9-foot diameter tunnel running from west to east along the 1-94 corridor. Downstream of this intersection, the 1-35W 13-foot diameter tunnel runs northeast until it reaches its ultimate receiving point and system outfall, the Mississippi River."	C	ELS	Jk
52	J. Grube (HennCty)	R	Pg. 19	Sec 4.1	Para 5	BP 2 – should read "1-35W and 35th Street	C	ELS	Jk
53	J. Grube (HennCty)	R	Pg. 19	Sec 4.2	BP 2	Third sentence should read "….due to drop and capacity issues."	C	ELS	Jk
54	J. Grube (HennCty)	R	Pg. 19	Sec 4.4	Para 1	Second sentence should read "Several iterations were modeled to analyze…."	C	ELS	Jk
55	J. Grube (HennCty)	R	Pg. 19	Sec 4.4	Para 1	Third sentence should read "The purpose of these iterations was to isolate….."	C	ELS	Jk
56	B. Neuendorf (MnDOT)	R	Pg. 20	Sec 4.4.1	Tab 8	For the SEH Existing Conditions Model, NOAA Atlas 14 Change in Elevation Values – When SRF ran the model back in 2006, they said how long it would take for the water levels to recede back to the top of the casting. Please include the timeframes here for these water levels.	Table Added to report	amh	Jk
57	B. Neuendorf (MnDOT)	R	Pg. 20	Sec 4.4.1	Tab 8	For the 42nd Street and 35W-:Low Point Location, NOAA Atlas 14 Values (all) – I am having trouble comprehending how these can be so different, please explain.	Text Added: The Existing Conditions model increased from the Minneapolis TP 40 model run as expected, because of the new Atlas 14 rainfall information. Additionally the inclusion of the junction flood storage function turned on decreased the continuity error in the model, and stopped the model from losing runoff volume.	amh	Jk
58	J. Grube (HennCty)	R	Pg. 21	Sec 4.4.1	Para 3	Fourth Sentence reads "This large increase in high water level elevation was seen at the 31st Street dropshaft and downstream at DS6 and DS7." – Will this be a problem for the Lake Street sewer extension?	This is looking at Atlas 14, and is not related to a physical change in the model.	amh	Jk

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Revwer
59	B. Irish (MnDOT)	R	ALL			The draft provides no specifics about proposed condition rate control or water quality BMPs or their cost, which agencies should pay for them, or which agency will maintain them.	Proposed conditions information will come in the next draft.	ELS	Jk
60	K. Moriarity (CityMPLS)	R	ALL			The report refers to "roadway improvements" or "Roadway project" a number of places in the report, but the project is more than just roadway (Transit etc.). Just delete roadway and refer to improvements or project.	C, throughout entire report	amh	Jk

S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\AgencyComments\75%Comments\Comment Spreadsheet_041514.doc

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question

(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

Project Type

Project Name

QC Reviewer Signature _____

Date Checked _____

REVIEW COMMENT FORM

Agency Comments .

Project Name **I-35W Corridor Drainage Study**

SEH Project Number **HENNC 113114**

Submittal Type (50%, etc.) **95% Submittal**

Date of Submittal **5/27/14**

Date of Response **6/16/14**

File: Document2

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
1	J. Grube	R	Cover Sheet			Title, Why use the term Preliminary, can we drop it?	It is a standard MnDOT term for a drainage report at this stage. It was discussed at the review meeting and decided to be left as is.	JTK	JTK
2	J. Grube	R	Cover Sheet			Are we going to use bold lettering to reference Tables or not – some are and some aren't, see Tables 8 and 9 references on pages 21 and 22	C, No Table references will be bolded.	amh	JTK
3	J. Grube	R	Executive Summary	P2	B2	Transit/Access Area – Change 33rd to "32nd"	C	ELS	JTK
4	J. Grube	R	Executive Summary	P2	B3	Gap Area change 33rd to "32nd"	C	ELS	JTK
5	J. Grube	R	Executive Summary	P2		"8.3" acres, is this the final figure?	C, Impervious totals were discussed during the meeting and revised to reflect current conditions of the roadway design	amh	JTK
6	J. Hager	R	Executive Summary	P2	B2	Change '33rd St' to '32nd St' to be consistent with previous communications and this document in subsequent pages.	C	ELS	JTK
7			Executive Summary	P5		"Proposed to be located in shouldering" change to shoulder	C	ELS	JTK

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question

(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

Project Type

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
8	B. Irish	R	Executive Summary			In the executive summary a statement should be added that "This study is not intended to develop solutions for current flooding conditions…", a statement should be added that the study is not intended to facilitate removal of existing orifice restriction from connections of Minneapolis neighborhoods or Lake Street.	C ,Statement added, will attach Technical memo detailing the addition of the Lake Street project	amh	JTK
9	S. Carlstrom	R	Executive Summary		All	The executive Summary states that the study provides preliminary design work that can be used for final design. As you pointed out, are there preliminary design scenarios sufficient in detail to jump to final design phase?	This preliminary design scenario can be used to jump to final design. Design elements will need to be updated and refined accordingly as is typically done with a Final Design process	ELS	JTK
10	B. Neuendorf	R	Executive Summary	P 4		"to provide a design that meets the local, State, and Federal stormwater requirements"…. How can you say this?	FHWA has been provided report.	JTK	JTK
11	B. Neuendorf	R	Executive Summary	P 5		Change 'four governing agencies' to 'three'	C	ELS	JTK
12	B. Neuendorf	R	Executive Summary	P 5		Add 'and', delete text after '(4)'	C	ELS	JTK
13	B. Neuendorf	R	Executive Summary	P 5		Change 'agency' to 'entity'	C	ELS	JTK
14	B. Neuendorf	R	Executive Summary	P 6	B 2	Add (MWMO) at end of sentence	C	ELS	JTK
15	B. Neuendorf	R	Executive Summary	P 10		"Additionally the project met…." What does this sentence mean? Please add in text to clarify.	Text added to clarify	ELS	JTK
16	J. Grube	R	Pg. 1			The Interstate Highway 35W (I-35W) Corridor Drainage Study" What is this?	Added clarification, this is a combination of the Gap, Transit Access and 94 Commons project.	Amh	JTK
17	B. Neuendorf	R	Pg. 1	1.1	P 1	Reword last sentence…. 'to meet local, State, and Federal Requirement'		JTK	JTK

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
18	J. Grube	R	Pg. 1	1.2	P3	Portland "Ave" changed to Avenue	C	ELS	JTK
19	J. Grube	R	Pg.2	1.2	P1	"surrounding neighborhoods has historical" replace with historically	C	ELS	JTK
20	B. Neuendorf	R	Pg. 2	1.3	P4	Change 'connected' to 'running parallel with'	C	ELS	JTK
21	J. Hager	R	Pg. 3	1.4.2	P2	Change 'Green Cresent' to 'High quality' because the connection will be high quality but mostly concrete with green elements.	C	ELS	JTK
22	B. Neuendorf	R	Pg 4	2.1	B 3	Add 'of the project area' after 'tunnelshed'	C	ELS	JTK
23	B. Neuendorf	R	Pg 4	2.2	P 1	Reword paragraph to 'Below are the stormwater regulations of the three organizations/governing agencies within the project area.'	C	ELS	JTK
24	K. Moriarity	R	Pg. 5	2.2.1.3		What is the (City of Minneapolis, 2014) citation referring to? This is not a new ordinance or requirement. If it is just saying these are the requirements as of 2014, it would be more clear to just state that in the text in 2.2.	That text is cited because the language of the standard is directly taken from the actual ordinance. Revised paragraph	ELS	JTK
25	B. Neuendorf	R	Pg. 6	2.2.3	Pt 2	Add 'for all structures that do not flood under existing conditions.'	C	ELS	JTK
26	B. Neuendorf	R	Pg. 6	2.2.3	Pt 2	In regards to the first sentence…… What about those structures that currently flood?	C, Added clarification, "No increase in HWL for structures that flood in existing conditions"	amh	JTK
27	J. Grube	R	Pg. 6	2.3	Bull et 2	"MnDOT's follows" change to MnDOT	C	ELS	JTK
28	J. Grube	R	Pg. 7	2.3.1.1		Based on the MWMO goals, the project "shall" change to "must"	C	ELS	JTK
29	J. Grube	R	Pg. 7	2.3.1.1	P3	"To meet the MWMO goal for the entire site, the remaining treatment needed would be the MWMO goal minus the NPDES standard" Say we are going to meet this?	Yes, the goal will be met. How the goal is met is outlined in Section 5.3.	ELS	JTK

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
30	J. Grube	R	Pg. 7	2.3.1.2		"Discharge rates for the study area shall" change to "Discharge rates for the study area may"	C	ELS	JTK
31	B. Neuendorf	R	Pg. 7	2.3.1.3	Pt 2	"A minimum of 0.5 feet of freeboard….." For those areas that do not currently flood?	This statement is correct. Text Added	amh	JTK
32	J. Grube	R	Pg. 8	3.1.2		Delete Random Text	C	ELS	JTK
33	B. Neuendorf	R	Pg. 8	3.1.2		Heading printed incorrectly	C	ELS	JTK
34	B. Neuendorf	R	Pg. 15	3.3.1.1		Change section name to 'Infiltration Location Criteria'	C	ELS	JTK
35	B. Neuendorf	R	Pg. 15	3.3.1.2 .2		Add 'Technical' before 'memorandum'	C	ELS	JTK
36	B. Neuendorf	R	Pg. 16	3.4		What happened to Sections 3.4.1.4 and 3.4.1.5? We had comments on these sections previously.	Those sections were renumbered to 3.4.3 and 3.4.4. The content is still the same as the previous submittal.	ELS	JTK
37	J. Grube	R	Pg. 16	3.4.1.2		"Passage thru Pits" change to through	That is the name of the software. It was left as is.	ELS	JTK
38	J. Grube	R	Pg. 16	3.4.1.2		TP, what's TP?	Total Phosphorus. Clarification added.	ELS	JTK
39	J. Grube	R	Pg. 20	4.2	B1	"Street low points", change to point	C	ELS	JTK
40	J. Grube	R	Pg. 20	4.2	B2	39th street, capitalize Street	C	ELS	JTK
41	B. Neuendorf	R	Pg. 20	4.2	B2	Add 'pressurization' and 'the geysering'	C	ELS	JTK
42	B. Neuendorf	R	Pg. 22	4.4.1	Table 8	Run at 5- and 10-yr for 2014 Existing Conditions and add how long it takes to draw down off roadways (in table)	All storm event high water levels and drawdown times added to Tables 25 for existing and proposed conditions models.	amh	JTK
43	B. Neuendorf	R	Pg. 22	4.4.1	Table 8	Why doesn't the content in the Location and Top of Casting columns match the information in Table 24?	Table 24 has been revised to accurately match the casting elevations in Table 8. The difference was attributed to the roadway channel shape within XPSWMM.	Amh	JTK

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
44	B. Neuendorf	R	Pg. 22	4.4.1	Table 8	Highlight everything circled on this table and in the footnotes. (See report for circled items)	Tables updated with highlights.	Amh	JTK
45	B. Neuendorf	R	Pg. 22	4.4.1	Table 8, KN 3	Why does page 6, sect 2.2.3, #2 say the opposite thing?	2.2.3 text has been modified	amh	JTK
46	B. Neuendorf	R	Pg. 22	4.4.1	Table 8	Add how long it takes the roadway to drain down in minutes. See comment 25	See Comment Response 42.	amh	JTK
47	J. Grube	R	Pg. 22	4.4		Table 8, Subscript 5, Verified with City of Minneapolis As-builts, where is this?	Subscript 5 added to the TOC column	amh	JTK
48	B. Neuendorf	R	Pg. 24	5.1.2	P 2	'The Corridor is being lowered 10-16 feet…..' Are you into the underlying soils with this lowering and stormsewer work? If so, did you account for that in your treatment areas for MWMO?	Yes the underlying soils will be disturbed and we have accounted for this area within the treatment calculations	amh	JTK
49	J. Grube	R	Pg. 24	5.1.4	P2	"As a result of the shouldering", change to shoulder	C	ELS	JTK
50	J. Hager	R	Pg. 24	5.1.2	P2	Is this (the first sentence) still accurate? I know we had talked about a scenario where the grade would drop significantly but did we land there?	C. Yes, Profile figure to be added to Appendices.	amh	JTK
51	J. Grube	R	Pg. 25	5.2	P2	"May 23, 2014 is 9.1 acres", not matching Table 10 below, reference to Table 26?	Paragraph revised for clarity	ELS	JTK
52	B. Neuendorf	R	Pg. 25	5.2	P2	This paragraph is an important piece of information and should be highlighted. All tables really should be revised with the new information.	Report information updated to reflect latest impervious areas.	amh	JTK
53	J. Grube	R	Pg. 26	5.2.2	P1	"Study Area shall not exceed" change to "Study Area may not exceed"	C	ELS	JTK
54	B. Neuendorf	R	Pg. 26	5.2.2.1	Title	What effect does lowering of this segment (94 Commons) have on the dropshafts	The dropshaft locations are not located within areas of major profile updates	amh	JTK
55	B. Neuendorf	R	Pg. 26	5.2.2.3		Replace 'historical air entrainment and flooding issues' with 'geysering at the surface but do not relieve the pressurization within the tunnel itself.'	C	ELS	JTK
56	B. Neuendorf	R	Pg. 26	5.2.3		Add 'from the top of casting' after '0.5 feet of freeboard;	C	ELS	JTK

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question

(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

Project Type

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
57	B. Neuendorf	R	Pg. 27	5.2.3.1		Where is the impact to HWL from lowering the roadway shown in the report?	See Table 24 for HWL Summary.	amh	JTK
58	B. Neuendorf	R	Pg. 27	5.2.3.1		What is the change in bounce? How long does it take the water to draw down during 5-, 10-, and 100-yr events?	Will add drawdown time to Tables. Reference to Table 24 added.	Amh	JTK
59	B. Neuendorf	R	Pg. 27	5.3.1	P1	How many SPCDs are recommended, and where?	Recommended features are outlined in Table 17 and Figures 12-14.	ELS	JTK
60	J. Grube	R	Pg. 28	T14/15		1' / ft freeboard not the same in tables.	C, changed to ft	amh	JTK
61	J. Grube	R	Pg. 29	5.3.1		"3045 pounds of TSS to meet the remaining goal of the project" add "as specified in Table 12"	C	ELS	JTK
62	B. Neuendorf	R	Pg. 29	5.3.1	P3	So 21 SPCD were reduced to 14 based on the SAFL Baffle results?	Yes. 21 locations were analyzed as potential locations. A total of 14 locations are needed if SAFL Baffles are chosen. Fewer devices may be required with a proprietary device.	ELS	JTK
63	B. Neuendorf	R	Pg 29	5.3.1	Tbl 17	What sizes of SPCDs are in Table 17?	All SPCD modeling was done with an 8' structure.	ELS	JTK
64	K. Moriarity	R	Pg. 29	5.3.1	Tb17	Is the number of Stormceptors known if the they are they chosen SPCD?	Yes. The removal amounts of Stormceptors are location in Appendix B. The locations can be hand selected as long as the sum of pounds of TSS removed meets the water quality goals.	ELS	JTK
65	J. Grube	R	Pg. 30	5.4.1	P1	"retaining the first inch of stormwater" change to "retaining the first inch of stormwater to meet the requirement listed in Table 12"	Reference to Table 13 added.	ELS	JTK
66	B. Neuendorf	R	Pg. 31	5.4.1.1		The SPCD total comes to 21, where are the 14 that are needed?	The 14 SPCD locations are outlined in Table 17 and shown in Figures 12-14	ELS	JTK
67	K. Moriarity	R	Pg. 34	5.4.3	P3	Does this include entire tunnelshed? (In reference to 'During the 100-year storm event…..)	Yes, the entire tunnelshed is included.	ELS	JTK

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.
Project Type

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken (C = Correction made. Use dwg or para number where correction made. If not corrected, explain)	Response By	QC Reviewer
68	B. Neuendorf	R	Pg. 35	5.4.3	Table 24	Run Table 24 at 5- and 10- year with filtration basins and add how long it takes to draw down off roadways.	Drawdown times added in Table 25.	Amh	JTK
69	B. Neuendorf	R	Pg. 35	5.4.3	Table 24	Why doesn't highlighted items match the information from Table 8 on Pg 22 (see comments for highlights)	See comment # 43	Amh	JTK
70	B. Neuendorf	R	Pg. 35	5.4.3	Table 24	Highlight the circled values in Table 24	C	amh	JTK
71	B. Neuendorf	R	Pg. 35	5.4.3	Table 24	Add another column in Table 24 for draw down times in roadways	Will update Table 24 with drawdown times	amh	JTK
72	B. Irish	R	Pg. 36	4.4.1	Table 8	In view of the recent concern about potential hazard of wet ponds to errant vehicles, the calculated depth of water shown in Table 8 during a 100-year event on the roadway at 42nd/I35W and I94/Portland of 13.6' and 9.4', respectively is understated.	Correct. As discussed during our Drainage Meetings, this potential depth of flooding on the roadway shouldn't be ignored. Language added to report in Section 4.4.1	amh	JTK
73	J. Grube	R	Pg. 36	5.4.3.2		Transit Access, Do we take into account the Lake Street Project which put a flow restriction on the system going into the 31st drop shafts?	The Lake Street project orifices are included in the model.	amh	JTK
74	J. Hager	R	Pg. 36	5.4.3.1		As noted above – is this still accurate? (Whole paragraph)	Yes, the roadway is being lowered. Will attach proposed roadway profile.	amh	JTK
75	B. Neuendorf	R	Pg. 37	6.2		Where is the top of the GW table? Is there 3' separation between the top of the GW table and the bottom of the basins?	According to the soil borings, the groundwater table is located at an elevation of approximately 810', this provides sufficient separation (40+feet)	amh	JTK
76	J. Grube	R	Pg. 37	6.5		"The new impervious area of 10.1 acres used in this design (See Table 13), change to Table 10.	Correct, reference changed to Table 10	ELS	JTK
77	K. Moriarity	R	Pg. 37	6.5		The Table 13 reference appears to reference Table 10	C	ELS	JTK

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.
Project Type

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
78	B. Neuendorf	R	Pg. 38	6.6		No changes to the existing storm sewer system within the tunnelshed can be made without approval by MnDOT, ie no additional stormwater can be added to the tunnel system	Noted. That is explained in Section 6.6 when discussing future modeling and design	ELS	JTK
79	S. Carlstrom	R	Pg 56	4.5.1	Table 9	Table 9 provides a quick summary of existing SWMM HWL(s) predicted at each dropshaft connection to the tunnel. However, there appears to be no analogous table for the proposed conditions which would allow comparison with the predicted HWL's. In addition, what is the purpose or statistical reason for reporting the sum of the peak charges at all six dropshaft locations without making a comparison to proposed conditions?	Table 24 Contains Proposed 100-year HWLs. The sum of the peak discharge rates are provide per the Rate Control requirement described in Section 2.3.1.2	amh	JTK
80	B. Irish	R	Fig 16			Label Streets. Show proposed inlet and outlet connections including size and invert elevations. Show HWL and provide information on control structure used to model HWL.	Figure updated	amh	JTK
81	B. Irish	R	Fig 17			Label Streets. Show proposed inlet and outlet connections including size and invert elevations. Show HWL and provide information on control structure used to model HWL.	Figure Updated	amh	JTK
82	B. Irish	R	Fig 18 and 19			Where is comparable figure for proposed improvements in Gap Area? Rather than using an aerial photo as base for figure, use a survey file or GIS file showing in-place stormsewer so that connection points for proposed stormsewer to existing stormsewer is clear. Show proposed size (although some are tabulated in Table 25) and invert elevations. Show what existing or proposed stormsewer that proposed SPCDs connect to. If I35W is to be lowered as discussed in 5.1.2, show all stormsewer on Figure 18 that will need to be replaced and tabulate HGL and rim elevations of affected structures.	Gap area Figure is located in Figure 20 Appendix A. As discussed in previous meetings MnDOT was going to survey the drainage infrastructure in the area to determine which pipes are in good condition. See Figures 22-28 for inverts, sewer sizes, existing/proposed stormsewer connection points and other design information.	amh	JTK
83	B. Irish	R	Fig 12, 13 and 14			SPCD locations as shown are not specific enough. Show connecting pipes for each SPCD with sizes and invert elevations. Show proposed rim elevation and build height of SPCD to confirm that they can be vacuumed out. Show diameter of SPCDs. Are high flow diversions needed for any of the SPCDs?	See Figures 22-28. The locations shown are preliminary and can change in final design phase.	ELS	JTK

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
84	B. Irish	R	Fig 21			Reduction of outside shoulder from 10' to 4' and reduction of median shoulder from 8.92' to 5.92' as shown in Figure 21 will necessitate additional catch basins, slotted drain, and connecting pipes to comply with spread design criteria. Include costs for this work in Appendix J cost estimate table.	This information is already included in the cost estimate table. Table updated to better clarify this.	amh	JTK
85	S. Carlstrom	R	Appendix B			The large Tables are confusing and do not make for ready comparison of existing versus proposed HWL's.	Large tables are intended to provide a non XPSWMM user the ability to research various nodes and links within the existing and proposed models.	amh	JTK
86	S. Carlstrom	R	Appendix B			Way too much emphasis on a nebulous "delta" concept for impervious surface. Simply compare the model results in an unambiguous way, and let the impervious surface quantities be represented in the models to represent the actual change in HWL and discharge.	The ponds do not detain all added runoff volume, however they are able to reduce the peak enough to meet the requirements. Additional storm sewer improvements were necessary as seen in Table 25. 3.2 acre feet of storage volume is provided in basins.	amh	JTK
87	S. Carlstrom	R	Overall		All	Since we have had insufficient time to do a "hands on" SWMM model review it seems fair to ask where the extra impervious area runoff is detained? In infiltration ponds, underground storage, etc. when there are large storm events?? Or is the solution orifice restriction, as mentioned by Minneapolis. This simply leaves more runoff in the streets and elsewhere a sort of de-facto detention to avoid increasing peak discharge(s) to tunnel. The total new impervious area is 9.1 acres, and thus it is not an insignificant amount of new runoff locally. How many acre feet of flood storage are provided in the two filtration basins mentioned in the Summary?	Here are the runoff volumes comparing an all pervious condition to an all impervious condition based on the net new impervious surface area of 9.1 acres Pervious (CN 69) – 3.0 acre-feet Impervious (CN 98) – 5.5 acre-feet The basins combined have a live storage volume of 3.5 ac-ft	amh	JTK

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
88	S. Carlstrom	R	Overall		All	Who will do maintenance for the new BMP infrastructure including the infiltration ponds, etc. proposed to provide flood storage and storm water treatment. Will there be a cost split? MNDOT will typically pay for such improvements based upon the area of City runoff versus MNDOT runoff on a prorated basis.	Based on typical MnDOT cost share, drainage areas/runoff value (C*A) to each basin will be determined based on the entity and costs/maintenance will be split accordingly.	JTK	JTK
89	J. Grube	R	Throughout			Whenever referencing street, i.e. DS1 (39th) etc, say street.	C	ELS	JTK
90	S. Carlstrom	R	Overall			The report could be greatly reduced in length. We are the client and do not need to know what ArcGIS is or XPSWMM is. We could stand to see figures integrated into the narrative showing the infiltration pond concepts and how much these ponds really reduce peak discharge(s) to the tunnel.	Understandably so. We want to make sure we are thorough so that whoever uses this document/data/models for the next phase of design will have a clear understanding of the next steps.	amh	JTK

S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\AgencyComments\95%Comments

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

QC Reviewer Signature _____

Date Checked _____

REVIEW COMMENT FORM

Agency Comments .

Project Name **I-35W Corridor Drainage Study**

SEH Project Number **HENNC 113114**

Submittal Type (50%, etc.) **98% Submittal**

Date of Submittal **7/21/14**

Date of Response **8/11/14**

File: Document2

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
1	Nnaemeka	R	General			The report makes no reference to correspondence between FHWA and MnDOT regarding the condition of the storm tunnel and subsequent projects. It also does not explain any rationale in retaining a substandard condition or highlight any concurrent or future efforts to resolve flooding. a. Without reading the I-35W and Saint Mary's report I don't know if a lay person could buy into the rationale for the tunnel being too big a problem to solve. Consider incorporating more information on top of the reference.	See Section 1.3.1 & 6.7 for more information on the I-35W and St. Mary's Tunnel Study.	ELS	JTK
2	Nnaemeka	R	General			There is a lot of focus on Q100 & 50 but we don't necessarily indicate if the tunnel is so substandard that is affects Q10 & 5 for example? Since the surge chambers have been installed what is the basic performance that the traveling public encounters? It would be nice to include recent high water flood records and/or incident data (accidents, delay, claims, etc.) to give context. Include the area and duration of flooding.	Table 26 includes additional detail in regards to less frequent events.	JTK	JTK
3	Nnaemeka	R	General			FHWA's policy on Interstate Reconstruction is to bring project elements up to full standards. The report makes no mention of spread criteria and how this relates to the design objective; provide safe passage of vehicles during design storm. Spread data needs to be provided for Q50 & 10	MnDOT TM 11-14-B-05 has been attached outlining the spread requirements for Interstate Highway systems (Appendix C). An additional quantity for CB's & pipe has been incorporated into the cost estimate.	JTK	JTK

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question

(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

Project Type

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
4	Nnaemeka	R	General			The report is clear there are three major low points but isn't clear how low points or sags are defined. Are we referring to a *true sag* as defined in MnDOT's drainage manual? Are there other locations within the study area where flooding is a concern. Low points, critical points, locations of interests, sags, etc. should be well described so reader knows where to focus attention when reviewing findings.	See Section 4.2 and Figure 35 for more information on critical and low points.	ELS	JTK
5	Nnaemeka	R	General			Section 1.3 makes reference to FHWA requirements but these requirements aren't highlighted in the project criteria section	FHWA letter in regards to the design standards has been included in Appendix C – C8	JTK	JTK
6	Nnaemeka	R	General			To what extent were contributing areas outside of Interstate r/w considered for detaining water	During the initial phases of the project, areas outside the r/w were vetted at a high level to determine the feasibility to be utilized for the project. Areas within the project limits were identified to meet the project requirements therefore these outside areas were not considered further	JTK	JTK
7	Nnaemeka	R	General			3.2.2.3 – the existing model was updated in 2006, since then the surge chambers and other improvements have taken place. I don't understand why this model wasn't re-calibrated. What is our level of reliability?	Section 3.2.2.3 has been updated to more accurately reflect the model and its calibration. The model was updated with the new surge chambers thereby making it a more accurate model building off of the calibration that has already been done.	ELS	JTK
8	Nnaemeka	R	General			3.3.1 – Structural Pollution Control Devices (SPCDs) - acronym	Edit made.	ELS	JTK

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
9	Nnaemeka	R	General			Downstream Defenders were used on the Crosstown but were not forwarded for modeling. Is this a result of poor performance? Please explain.	Other cheaper devices such as the SAFL Baffle have been developed since the Crosstown Project. In addition the stormcepter demonstrated the greatest removal efficiency of the SPCD's therefore these 2 devices were selected as the primary options.	JTK	JTK
10	Nnaemeka	R	General			Global comment: if the 46th Street low point contributes to the tunnel which starts at 39th street would our limits be from 46th to the Mississippi River? Consider adding 46th St. to low points/critical area (Section 4.1.)	See Comment #4.	ELS	JTK
11	Nnaemeka	R	General			4.4.1: How did we develop critical areas in Table 8? How do these relate to sag locations? See previous comments.	See Comment #4. Critical locations were developed based on sag points and drop shafts where we could get develop a baseline to demonstrate the project was meeting the design criteria	JTK	JTK
12	Nnaemeka	R	General			Section 5.2.2 what is the logic in reporting rate control on a cumulative or project wide basis versus at specific locations? I know it's not arbitrary but it seems problematic given flooding in the base condition.	The project is required to not increase flood levels and not create new flooding pre/post project. This allows the project to look at rate control from a cumulative with the controls in place to no exacerbate flooding.	JTK	JTK
13	Nnaemeka	R	General			Consider another name for Storage South Basin (B)	The basins have been renamed as follows: North Basin = 24th St. Basin South Basin (A) = 33rd St. North Basin South Basin (B) = 33rd St. South Basin	ELS	JTK

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
14	Nnaemeka	R	General			Great to see noticeable decreases in discharge rates, but how does this translate into flooding? Proposed 50 Year Discharge Rates Results missing. After reductions and improvements how is the tunnel expected to perform?	See Table 23 for Proposed 50-Year Discharge Rate Results.	ELS	JTK
15	Nnaemeka	R	General			Include cost of improvements in text (Section 6)	Table added to Section 6.1.	ELS	JTK
16	Nnaemeka	R	General			Plotting the hydraulic grade line along corridor or at key locations versus tables could be easier to digest	Hydraulic grade lines located in Appendix A, Figures 31-34. Note added in 5.4.3	ELS	JTK
17	Moriarity	R	General			Study Area, Project Area, and corridor are used to describe the area requiring water quality treatment in various places in the report, are these all one in the same?	Terminology was changed to provide more clarity.	ELS	JTK
18	Moriarity	R	Executive Summary			In the executive summary the rate control requirements are labeled as coming from MWMO, but that is not the only reason the project has that requirement.	City added	ELS	JTK
19	Irish	R	Executive Summary			Please clarify "the project met the high water level criteria for the 50-year storm event." Does this mean that the Trunk Storm Sewer criterion discussed in the Sec. 2.3.1.3(2) is met even though Table 8 in 4.4.1 shows inundation of the I94/I35W at Portland sag to 9.4' and flooding of the I35W at 42nd Street sag to a depth of 13.6 feet for the 100-year event?	Clarification was added to the executive summary and Sect 2.3.1.3(2)	JTK	JTK
20	Neuendorf	R	Executive Summary			Highlighted "and Federal requirements outlined in the report" Where are the Federal requirements outlined in the report?	FHWA memorandum added to appendix and noted in the standards (Sec. 2.2.3)	JTK	JTK
21	Neuendorf	R	Pg. 1	1.1		Highlighted "and key design elements to meet local, state and federal requirement". Noted same comment as stated before	See response for Comment #20	JTK	JTK
22	Neuendorf	R	Pg. 4	2.2	B.pt #2	Delete "governing"	Corrected.	ELS	JTK

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.
Project Type

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
23	Moriarity	R	Pg. 6	2.3		Describes the different stormwater standards the project would have to meet depending on who lets the project(s), if the MWMO requirements were not necessary is that difference just the additional SPCD's?	Updated in Executive Summary along with Section 5.4.1	JTK	JTK
24	Johnson	R	Pg. 18	4.1	Table 6	There is an error in the total existing impervious area and existing impervious percentages on Page 19 in Table 6. In addition, the impervious values listed in Tables 6 and 10 (pages 19 and 25, respectively) are slightly different than those included in Figures 5-10	Comment from an older version of the report.	JTK	JTK
25	Neuendorf	R	Pg. 19	4.2		Add to end of paragraph "However, pressurization and capacity issues still exist within the tunnel system"	Comment added.	ELS	JTK
26	Irish	R	Pg.21	4.4.1	Table 8	Table 8 should show duration of time that water level is above rim elevation.	Drawdown times for all storm events are located in Table 26.	ELS	JTK
27	Neuendorf	R	Pg. 28	5.3.1	Para #3	In regards to SPCD's. "Are they all located in areas that are accessible to Maintenance w/out needing to shut down traffic lanes?	See Section 6 for more detailed SPCD location and lane closure information.	ELS	JTK
28	Irish	R	Pg. 28	5.3.1		Please clarify discussion after Table 17 that "located within and outside the project limits (4, 5, 8, 9, 10, 11 and 14). These SPCD's do not need to be installed to meet project TSS removal requirement." Why were they studied or included in the report? Provide specifics about SAFL Baffles including connecting pipe sizes, structure diameter and depth, and how practical access for inspection and cleaning is to be provided.	For specific SPCD information, see Figures 22-28.	ELS	JTK
29	Irish	R	Pg. 28	5.3.1		Provide specifics on proposed filtration basin control structures and HWL in filtration basins. Two feet of freeboard from the 100-year HWL to low point on the top of berm	See Figures 16-17 for specific filtration basin information.	ELS	JTK

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
30	Irish	R	Pg.33	5.4.3	Table 24	Table 24 should show duration of time that water level is above rim elevation.	Drawdown times are located in Table 26.	ELS	JTK
31	Irish	R	Pg. 34	5.4.3	Table 25	If the existing orifice (provide table of all existing orifices) at Lake Street are to remain in place, why do the Transit Access segment pipes need to be upsized? Provide specifics of length and build height at connections. Please provide profile and HGL of pipes within 94 Commons to be lowered.	Existing orifices are referenced in the attached Hennepin County West Lake Street Improvements – Stormwater Review memorandum. See Figures 22-28 for detailed pipe information.	ELS	JTK
32	Neuendorf	R	Pg. 38	6.6	Para #2	Replace "the Final Design" with "future projects"	Corrected.	ELS	JTK
33	Irish	R	Appendix A			GIS maps of proposed SPCD's are vague. How will access for inspection and cleaning be provided.	Updated locations are in figures created for 99% submittal. See Comment 27.	ELS	JTK
34	Irish	R	Appendix B			Repeat column headings on each page	Corrected.	ELS	JTK
35	Irish	R	Appendix J			No slotted drains are shown in the Preliminary Cost Estimate and average spacing between inlets works out to about 230'. In view of proposed narrow shoulders and some segments with relatively flat slope appears that compliance with spread criteria will be difficult to achieve.	Cost estimate has been updated to include additional cb's for all 3 segments.	JTK	JTK
36	Moriarity	R	Appendix J			How were the costs for the filtration basins distributed between the project segments? Is the north basin necessary to mitigate (at least in part) the transit access project rate and NPDES requirements?	Cost split figures have been created detailing contributing drainage areas to each. Yes the north basin is necessary to treat in part the transit access rate control and NPDES Permit requirements.	JTK	JTK

S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\AgencyComments\100%Comments

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.
Project Type

QC Reviewer Signature _____

Date Checked _____

REVIEW COMMENT FORM

Agency Comments .

Project Name **I-35W Corridor Drainage Study**

SEH Project Number **HENNC 113114**

Submittal Type (50%, etc.) **99% Submittal**

Date of Submittal **9/10/14**

Date of Response **9/22/14**

File: Document2

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
1	Neuendorf	R	Executive Summary	Para 1		Remove "existing conditions of the Study Area"	Corrected	ELS	JTK
2	Neuendorf	R	Executive Summary	Para 1		The fed. Req's need to be outlined in the report if this is being said: -Spread: 10 yr shoulder confinement, 50 yr sag-shoulder confinement, 100 yr 1 lane passible -Appendix C: re: tunnel capacity issues	Language noting that all federal requirements have been met has been removed and revised accordingly. Additional text has been added to the report discussing the FHWA requirements and how the project plans to meet or not meet these requirements (design exemption)	JTK	JTK
3	Neuendorf	R	Executive Summary	Para 4		I don't think we can say that we are meeting the fed. requirements	See #2 response	JTK	JTK
4	Neuendorf	R	Executive Summary	Para 6	BP 2	Remove "and City"	Left as is per Meeting	JTK	JTK
5	Neuendorf	R	Executive Summary	Para 6	BP 3	Add "(Project goal)"	Corrected	ELS	JTK
6	Neuendorf	R	Executive Summary	Para 8		Where is the documentation of why you cannot infiltrate? Should be included.	MnDOT TM was added to appendix as C1, replacing the draft version included in the appendix prior to	JTK	JTK
7	Neuendorf	R	Executive Summary	Para 12		Remove "standards"	Removed	ELS	JTK

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question

(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

Project Type

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
8	Neuendorf	R	Executive Summary	Para 13		Question on last sentence of paragraph	Text revised per meeting discussion	JTK	JTK
9	Neuendorf	R	Executive Summary	Para 14		Aren't large storm event routed around the filtration basins? (Regarding "The storage volume provided in the filtration basins for the 100-yr event is approx. 3.6 ac-ft")	Clarification added to the paragraph	JTK	JTK
10	Neuendorf	R	Page 1	1.1	Para 1	Remove "existing conditions of the Study Area"	Corrected.	ELS	JTK
11	Neuendorf	R	Page 1	1.1	Para 1	Still having a hard time with this. I don't think we are meeting the Fed. Requirements. I think we need to list out that the Fed. Requirements are – as I listed on page ES-I, and then say why we are not meeting them.	See response to Comment #2	JTK	JTK
12	Neuendorf	R	Page 1	1.1	Para 3	Same as comment 11	See response to Comment #2	JTK	JTK
13	Neuendorf	R	Page 2	1.2	Para 1	Change 'Loring Pond' to 'Loring Park'	Corrected.	ELS	JTK
14	Neuendorf	R	Page 2	1.2	Para 1	Include City drainage area of tunnelshed	City drainage area added to paragraph.	ELS	JTK
15	Neuendorf	R	Page 3	1.3.1	Para 2	Typo: Severe	Corrected.	ELS	JTK
16	Neuendorf	R	Page 3	1.3.1	Para 5	Add "in 2006 dollars" to both costs	Corrected.	ELS	JTK
17	Neuendorf	R	Page 26	5.2	Para 2	Remove second sentence. You incorporated the new area right into all the tables? So, don't need this anymore?	Corrected.	ELS	JTK
18	Neuendorf	R	Page 30	5.4.1	Para 1	"A SPCD is recommended…. These SPCDS were not included within the WQ analysis" Why? Then 3 will be required. Is there room for them? They should be included and accounted for in this study.	As discussed at the meeting, these items have been included in the cost estimate but not within the water quality.	JTK	JTK

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

QC Reviewer Signature _____

Date Checked _____

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
19	Neuendorf	R	Page 34	5.4.1	T 23	Results seem reversed?	Results are reported correctly	JTK	JTK
20	Nnaemeka	R	Page 34	Table 23		Note Q50 discharge in fact increases	Noted	JTK	JTK
21	Neuendorf	R	Page 37	5.4.2.2	T 26	Are you sure this result is in minutes? 5-yr, 42nd St. and 35W low point	Yes – results were verified they are in minutes	JTK	JTK
22	Nnaemeka	R	Page 37	Table 26		Note the drawdown time are made worse at 42nd St., noticeably for Q5 1min to 74 mins	Noted	JTK	JTK
23	Nnaemeka	R	Page 38	Table 27		Double check or correct the 2014 Existing Condition, Q10 @31st St. Dropshaft 935.2	Result revised accordingly	JTK	JTK
24	Neuendorf	R	Page 40	6.2		In the soil borings that were done in the area of the filtration basins, where was groundwater at in relationship to the basin bottoms?	Based on the limited soils information we have available, no groundwater was encountered within 3 feet of the basin bottoms. Additional soils information will be needed to properly define the groundwater conditions at each basin.	JTK	JTK
25	Neuendorf	R	Page 42	6.6.1		"to mitigate for lesser storm events" Really? Which ones? I believe the surge chambers were to eliminate (visually) the geysering.	Text was revised accordingly based on the meeting discussion	JTK	JTK
26	Neuendorf	R	Page 42	6.6.1		Add "However, funding for such a system is unlikely" to end of paragraph.	Corrected.	ELS	JTK
27	Neuendorf	R	Page 42	6.6.2	P 1	Add "and volumes" after 'they are not increasing the discharge rates…..'	Corrected.	ELS	JTK
28	Neuendorf	R	Page 42	6.6.2	P 2	Remove "peak discharge rates are maintained and there is no increase in flooding to" and add "no additional stormwater will be added" in its place	Corrected.	ELS	JTK

S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\AgencyComments\99%Comments

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question
(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.
Project Type

QC Reviewer Signature _____

Date Checked _____

REVIEW COMMENT FORM

Agency Comments .

Project Name **I-35W Corridor Drainage Study**

SEH Project Number **HENNC 113114**

Submittal Type (50%, etc.) **99.5% Submittal**

Date of Submittal **10/17/14**

Date of Response **10/27/14**

File: Document2

Item #	Name	Type (1)	No. (2)	Addl. Ref. 1	Addl. Ref. 2	Comments	Action Taken *(C = Correction made. Use dwg or para number where correction made. If not corrected, explain)*	Response By	QC Reviewer
1	Neuendorf	R	Sec. 5.4.1 Pg. #33	1st para		Replace the following sentence "These SPCD's were not included within the water quality analysis." With "These SPCD's were included within the filtration basin analysis as a combination SPCD pretreatment and filtration final treatment system."	Text revised accordingly	JTK	JTK
2	Neuendorf	R	Sec. 6.2 Pg #42			Thought you had info. from borings that mentioned groundwater table depth. Include here. Didn't think GW was a problem.	Correct. Additional language was added to the paragraph clarifying the groundwater depth based on information obtained to date. Groundwater levels were found to be greater than 10 feet below the proposed basin bottom based on the borings obtained. Therefore it doesn't appear to be an issue but additional borings should be obtained to verify this is correct.	JTK	JTK
3	Moriarity	R	Sec 6.6.2 Pg. #44			Add "and the City" after MnDOT	Text added to Section	JTK	JTK

S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Preliminary Drainage Report\AgencyComments\99%Comments

(1) **Type**: D = Drawing SP = Spec R = Report CE = Cost Estimate SC = Schedule CA = Calculation SK = Sketch Q=Question

(2) **No:** Drawing number, Spec number, Page number, Paragraph number, etc.

Project Type

QC Reviewer Signature _____

Date Checked _____

This Page Left Blank Intentionally

Appendix G

Project Data (CD)

This Page Left Blank Intentionally

Appendix H

XP-SWMM Model (CD)

This Page Left Blank Intentionally

Appendix I

Recommended Product Data Sheets

Figure I1 – SAFL Baffle® Data Sheet
Figure I2 – Stormceptor® Data Sheet

This Page Left Blank Intentionally

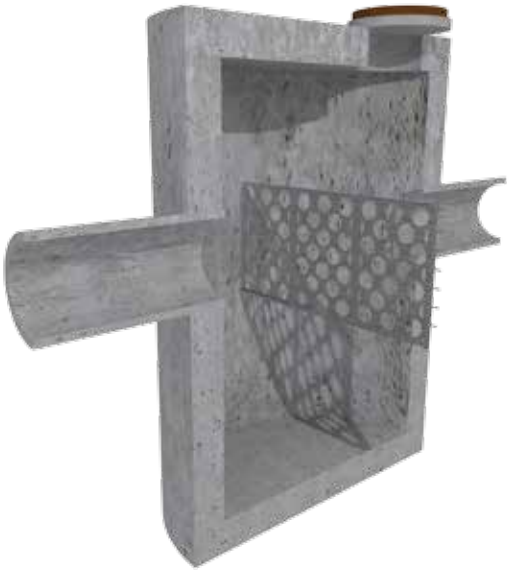
www.RevolutionaryBaffle.com

Upstream Technologies
550 County Road D West, Suite 3
New Brighton, MN 55112
651.633.6921

SAFL BAFFLE

45 MINUTE STORMWATER SEDIMENT SOLUTION

The SAFL Baffle* is the best way to keep sediment pollution out of lakes, rivers, and oceans. It fits into both new and existing sump manholes, where it upgrades them to capture more sediment found in stormwater. Installation takes about 45 minutes and captured sediment can be conveniently removed with a vacuum truck. Without the SAFL Baffle, sediment collects in ponds, wetlands, and infiltration basins, which must be periodically maintained. Collecting sediment upstream with a SAFL Baffle will extend the lives of downstream BMPs, significantly reducing long term maintenance costs.

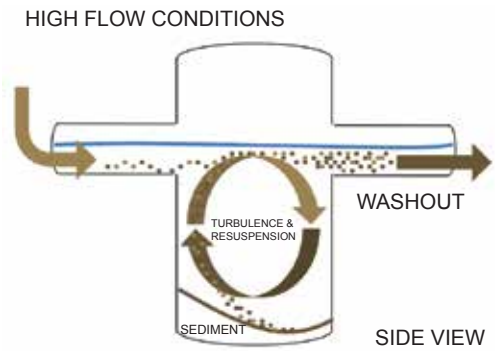


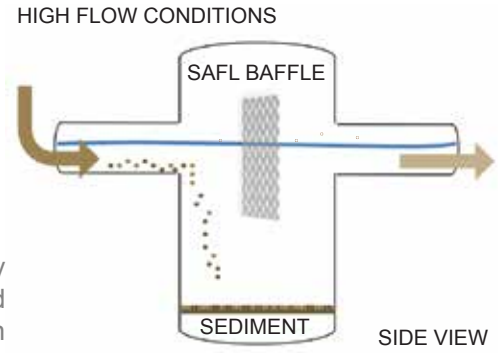
90%
REDUCTION OF MAINTENANCE COSTS OVER DREDGING

45
MINUTE INSTALL

RETROFITS
AND NEW CONSTRUCTION

STARTING AT
$3275





Washout Protection

Four years of testing at the University of Minnesota's St. Anthony Falls Laboratory showed the SAFL Baffle to dramatically reduce washout of previously collected sediment. The SAFL Baffle does this by preventing a circular, plunging flow pattern from occurring within the sump manhole at high flow rates.

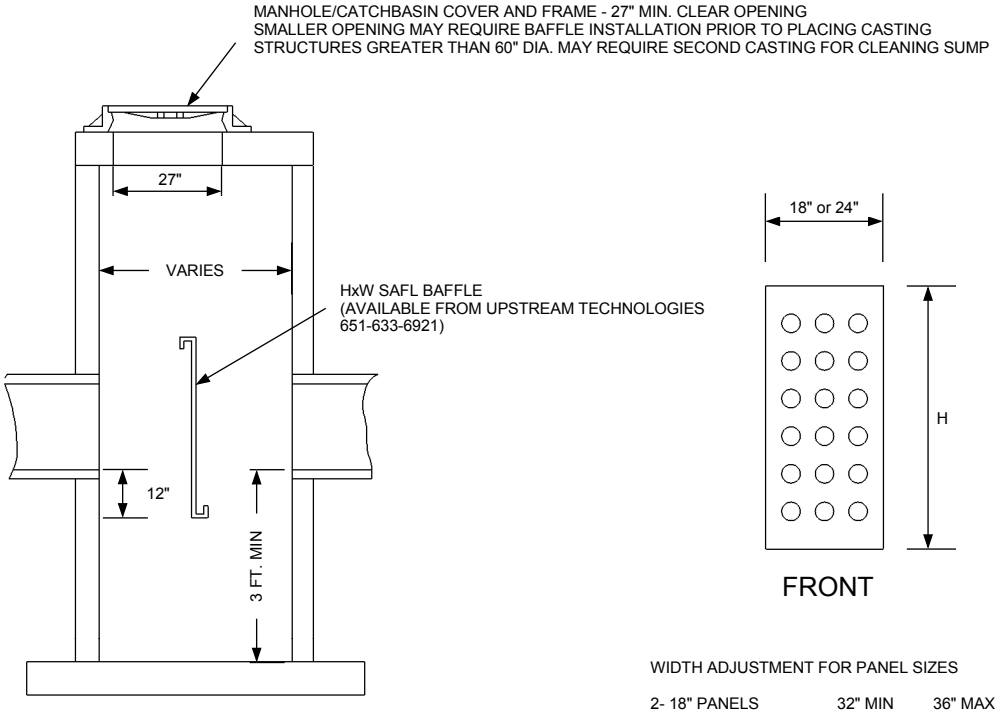
Stainless Steel

Every piece of the baffle fits through a casting

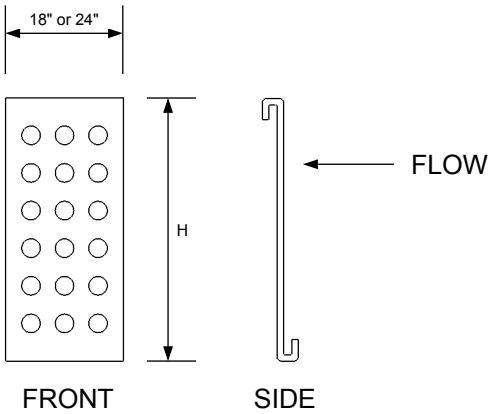
Easy Install

Installs with a hammer drill, bubble level and wrenches

*Patent Pending



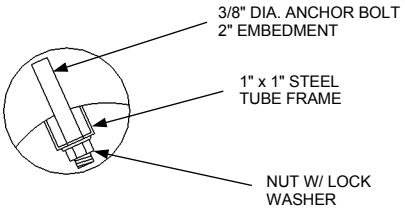
SAFL BAFFLE INSTALLATION DETAIL



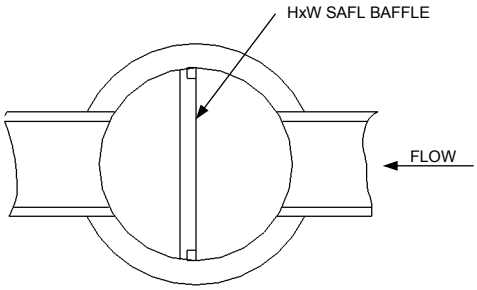
WIDTH ADJUSTMENT FOR PANEL SIZES

2- 18" PANELS	32" MIN	36" MAX	4" TOTAL
2- 24" PANELS	44" MIN	48" MAX	4" TOTAL
3- 18" PANELS	46" MIN	54" MAX	8" TOTAL
3- 24" PANELS	64" MIN	72" MAX	8" TOTAL

SAFL BAFFLE PANEL DETAIL



SAFL BAFFLE ATTACHMENT BOLT DETAIL



SAFL BAFFLE INSTALLATION PLAN

NOTES:

1) UPSTREAM TECHNOLOGIES INC. IS THE EXCLUSIVE LICENSEE OF THE SAFL BAFFLE

2) CONTRACTOR MUST VERIFY LOCATION OF CASTING AND STEPS PRIOR TO INSTALLATION OF THE STRUCTURE

3) CONTRACTOR STRUCTURES GREATER THAN 72" REQUIRE SECOND CASTING FOR MAINTENANCE ACCESS

4) THIS GENERIC DETAIL DOES NOT ENCOMPASS THE SIZING, FIT AND APPLICABILITY OF THE SAFL BAFFLE FOR THIS SPECIFIC PROJECT. IT IS THE ULTIMATE RESPONSIBILITY OF THE DESIGN ENGINEER TO ASSURE THAT THE DESIGN IS IN COMPLIANCE WITH ALL APPLICABLE LAWS AND REGULATIONS. THE SAFL BAFFLE IS PATENT PENDING TECHNOLOGY OF THE UNIVERSITY OF MINNESOTA AND UPSTREAM TECHNOLOGES, INC. NEITHER THE UNIVERSITY OF MINNESOTA NOR UPSTREAM TECHNOLOGIES APPROVES PLANS, SIZING, OR SYSTEM DESIGNS.

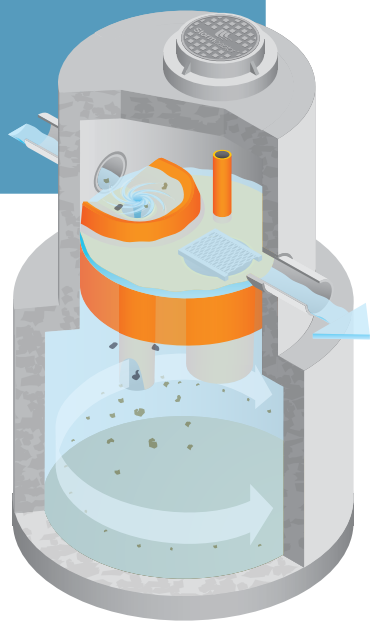
THROUGH PIPE CONFIGURATION

SAFL BAFFLE STANDARD DETAIL
UPSTREAM TECHNOLOGIES
NEW BRIGHTON, MN
651-633-6921

www.RevolutionaryBaffle.com

Upstream Technologies

Stormceptor® STC



The calm *during* the storm

When it rains, oils, sediment and other contaminants are washed from paved surfaces directly into our storm drains and waterways. Non-point source pollution such as stormwater now accounts for 80% of water pollution in North America and governments are responding with demanding regulations to protect our water resources.

Removing more pollutants

Stormceptor removes more pollutants from stormwater than any other separator.

- Maintains continuous positive treatment of total suspended solids (TSS) year-round, regardless of flow rate
- Designed to remove a wide range of particle sizes (from 20 to 2,000 microns), as well as free oils, heavy metals and nutrients that attach to fine sediment
- Can be designed to remove a specific particle size distribution (PSD)

A calm treatment environment

- Stormceptor slows incoming stormwater to create a non-turbulent treatment environment, allowing free oils and debris to rise, and sediment to settle
- Patented scour prevention technology ensures pollutants are captured and contained during all rainfall events, even extreme storms

PCSWMM for Stormceptor – leading the industry

The most accurate, easy to use design tool available.

- This continuous simulation modeling software combines up-to-date local rainfall data from hundreds of stations across North America with a selection of particle sizes to design the best system for your site
- Developed with Computational Hydraulics International (CHI), internationally acclaimed expert, Dr. Bill James and Imbrium Systems

Proven performance

- Recent tests conducted for the New Jersey Department of Environmental Protection (NJDEP) found Stormceptor has the highest TSS removal rate of seven stormwater treatment technologies tested
- Stormceptor STC has been verified not to resuspend previously captured pollutants by NJCAT and an independent testing body
- Stormceptor STC is entering into Tier II of the TARP Program (administered by NJDEP)
- Stormceptor's performance is backed by Canada's stringent Environmental Technology Verification (ETV) Program

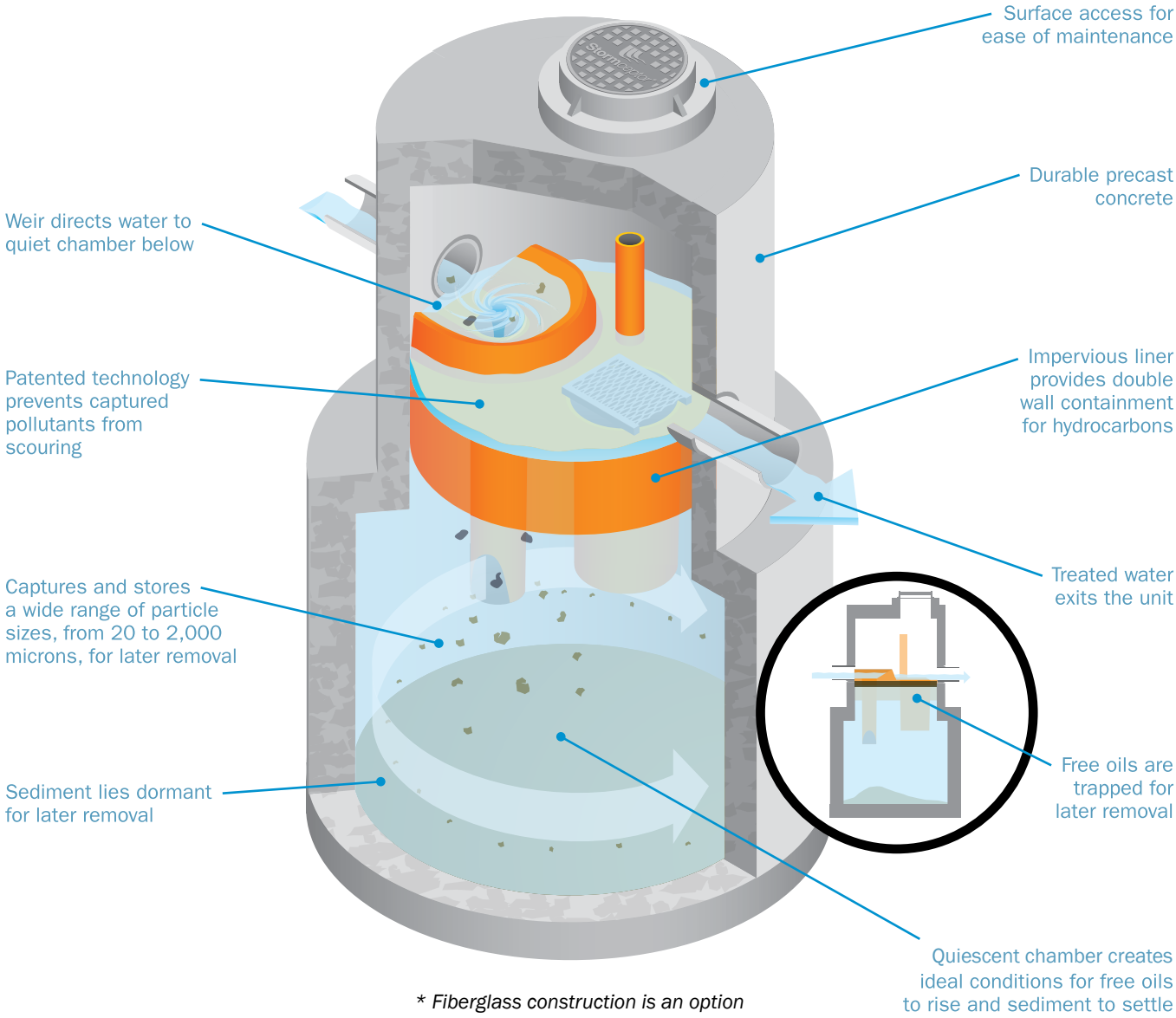
With over 25,000 units operating worldwide, Stormceptor performs and protects every day, in every storm.

imbriumsystems.com USA: (888) 279 8826 CANADA: (800) 565 4801 INT'L: +1 416 960 9900

imbrium™

Stormceptor® STC

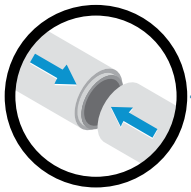
The calm *during* the storm



** Fiberglass construction is an option*

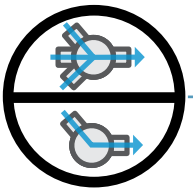
Easy to install

Small footprint saves time and money with limited disruption to your site.



Seamless

Minimal drop between inlet and outlet pipes makes Stormceptor ideal for retrofits and new development projects.



Flexible

Multiple inlets can connect to a single unit.

Can be used as a bend structure.

imbriumsystems.com USA: (888) 279 8826 CANADA: (800) 565 4801 INT'L: +1 416 960 9900

imbrium™

Appendix J

Preliminary Cost Estimate

This Page Left Blank Intentionally

Preliminary Cost Estimate
I-35W Corridor Drainage Study
HENNC 113114
Date: 9/9/14
Pathway: S:\FJ\H\Hennc\113114\5-dsgn\50-WaterResources\Cost Estimate

Item No.	Item Description	Unit	Unit Price	94 Commons Quanitites		Transit/Access Quantities		Gap Quantities		Total Quantities	Total Cost
					Filtration Basins						
1	Filter Topsoil Borrow	CY	$ 35.00	154	$ 5,401.67	144	$ 5,045.19	0	0	298	$ 10,446.85
2	Common Excavation	CY	$ 15.00	2450	$ 36,752.22	7203	$ 108,040.56	0	0	9653	$ 144,792.78
3	6" PVC Pipe Drain Cleanout	EA	$ 350.00	11	$ 3,850.00	16	$ 5,600.00	0	0	27	$ 9,450.00
4	6" PERF PVC Pipe Drain	EA	$ 9.00	525	$ 4,725.00	450	$ 4,050.00	0	0	975	$ 8,775.00
5	Geotextile Filter Type IV	SY	$ 3.00	811	$ 2,432.67	774	$ 2,321.67	0	0	1585	$ 4,754.33
6	Guide Post Type B	EA	$ 50.00	2	$ 100.00	4	$ 200.00	0	0	6	$ 300.00
7	Install Guide Post Type B	EA	$ 30.00	2	$ 60.00	4	$ 120.00	0	0	6	$ 180.00
8	Random Riprap Class III	CY	$ 64.00	28	$ 1,798.40	28	$ 1,785.60	0	0	56	$ 3,584.00
9	Sheet Pile Wall	SF	$ 40.00	11440	$ 457,600.00	0	$ -	0	0	11440	$ 457,600.00
10	12-18" RC Pipe Apron	EA	$ 600.00	1	$ 600.00	0	$ -	0	0	1	$ 600.00
11	21-30" RC Pipe Apron	EA	$ 800.00	1	$ 800.00	0	$ -	0	0	1	$ 800.00
12	36-48" RC Pipe Apron	EA	$ 1,700.00	0	$ -	2	$ 3,400.00	0	0	2	$ 3,400.00
13	Const Drainage Structure Special	EA	$ 5,000.00	1	$ 5,000.00	2	$ 10,000.00	0	0	3	$ 15,000.00
14	Basin Plantings	LS	$ 15,000.00	1	$ 15,000.00	2	$ 30,000.00	0	0	3	$ 45,000.00
Filtration Basins Subtotal				*$ 534,119.96*		*$ 170,563.01*		*$ -*			*$ 704,682.96*
					SPCDS						
15	SAFL Baffle - Pretreatment	EA	$ 5,000.00	2	$ 10,000.00	1	$ 5,000.00	1	$ 5,000.00	4	$ 20,000.00
16	SAFL Baffle	EA	$ 5,000.00	5	$ 25,000.00	6	$ 30,000.00	3	$ 15,000.00	14	$ 70,000.00
17	Existing Storm Sewer Connections	EA	$ 1,500.00	10	$ 15,000.00	12	$ 18,000.00	6	$ 9,000.00	28	$ 42,000.00
18	Const Drainage Structure Des 96-4020-66-4020	EA	$ 6,000.00	5	$ 30,000.00	6	$ 36,000.00	3	$ 18,000.00	14	$ 84,000.00
19	12-18 in RC PIPE DES 3006 CL III	LF	$ 55.00	0	$ -	200	$ 11,000.00	0	$ -	200	$ 11,000.00
20	21-33 in RC PIPE DES 3006 CL III	LF	$ 70.00	150	$ 10,500.00	75	$ 5,250.00	375	$ 26,250.00	600	$ 42,000.00
21	36-48 in RC PIPE DES 3006 CL III	LF	$ 150.00	100	$ 15,000.00	300	$ 45,000.00	0	$ -	400	$ 60,000.00
22	60 in RC PIPE DES 3006 CL IV	LF	$ 200.00	0	$ -	0	$ -	50	$ 10,000.00	50	$ 10,000.00
SPCDs Subtotal				*$ 105,500.00*		*$ 150,250.00*		*$ 83,250.00*			*$ 339,000.00*
					Storm Sewer Infrastructure						
23	Remove Storm Sewer Pipe	LF	$ 20.00	7600	$ 152,000.00	3230	$ 64,600.00	3670	$ 73,400.00	14500	$ 290,000.00
24	Remove Storm Structure	EA	$ 370.00	122	$ 45,140.00	46	$ 17,020.00	78	$ 28,860.00	246	$ 91,020.00
25	Casting Assembly	EA	$ 670.00	258	$ 172,860.00	163	$ 109,210.00	207	$ 138,690.00	628	$ 420,760.00
26	Const Drainage Structure Des 48-4020 to 54-4020	EA	$ 1,440.00	244	$ 351,360.00	158	$ 227,520.00	200	$ 288,000.00	602	$ 866,880.00
27	Const Drainage Structure Des 60-4020 to 84-4020	EA	$ 2,250.00	14	$ 31,500.00	5	$ 11,250.00	7	$ 15,750.00	26	$ 58,500.00
28	Existing Storm Sewer Connections	EA	$ 1,500.00	15	$ 22,500.00	20	$ 30,000.00	15	$ 22,500.00	50	$ 75,000.00
29	12-18 in RC PIPE DES 3006	LF	$ 55.00	8670	$ 476,850.00	5400	$ 297,000.00	7460	$ 410,300.00	21530	$ 1,184,150.00
30	21-30 in RC PIPE DES 3006	LF	$ 75.00	2020	$ 151,500.00	1260	$ 94,500.00	1220	$ 91,500.00	4500	$ 337,500.00
31	36-48 in RC PIPE DES 3006	LF	$ 150.00	1210	$ 181,500.00	330	$ 49,500.00	260	$ 39,000.00	1800	$ 270,000.00
32	54-60 in RC PIPE DES 3006	LF	$ 200.00	0	0	250	50000	0	$ -	250	$ 50,000.00
Storm Sewer Infrastructure Subtotal				*$ 1,585,210.00*		*$ 950,600.00*		*$ 1,108,000.00*			*$ 3,643,810.00*
			Project Subtotal -	$ 2,224,900.00		$ 1,271,500.00		$ 1,191,300.00			$ 4,688,000.00
			Contingency (30%) -	$ 667,470.00	$ -	$ 381,450.00	$ -	$ 357,390.00			$ 1,406,400.00
			Preliminary Estimate Cost per Project Segment -	$ 2,892,400.00	$ -	$ 1,653,000.00	$ -	$ 1,548,700.00			
										Preliminary Estimated Cost -	**$ 6,095,000.00**

- estimate includes pipe extensions, new cb's and laterals to accommodate the widening of the Gap segment